

# NJISS

## Nepalese Journal of Insurance and Social Security

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*(Annual peer reviewed journal)*



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## ***Nepalese Journal of Insurance and Social Security***

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### **Editorial Note**

Dear Readers,

The journey of the Nepalese Journal of Insurance and Social Security (NJISS) completed four years from the first issue in 2018 to the fourth issue in 2021. During the period, NJISS is awarded as a two-star journal from Journal Publishing Practices and Standard Framework (<https://www.journalquality.info/>). The Editorial Board would like to express words of gratitude to JPPS for rigorous reviewing of the published journal, providing feedback, and encouraging and supporting the regular publication of the journal. Similarly, a team of the journal is indebted to authors, reviewers, and advisors for their valuable contribution and time.

A large number of authors trusted the NJISS and send their manuscript for the fourth issue. We selected eight original research papers for this issue that met the minimum criteria of the journal and follow the peer review process stringently. Authors who failed to publish their manuscript in this issue are requested to send the manuscript for the next issue with necessary improvement and bring it under the scope of the journal.

The current issue has included articles from different subdomains viz. social health insurance, microfinance, social security, the performance of insurers, and actuarial science.

The journal always welcomes critically reviewed papers on up-to-date subjects on any of the topics in the area of risk, insurance, social security, microfinance, pension, annuity, and the related disciplines.

I would like to request the prospective authors to update the guidelines of the journal and submit them on time for the forthcoming issue.

Prof. Fatta Bahadur KC

Editor-in-Chief

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## Do people's perceptions and attitudes associate with enrollment in health insurance in a context of Nepal?

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### Abstract

The Government of Nepal introduced the health insurance [HI] program in three districts, in 2016 and now has been expanded almost all districts. Since it was a new initiative, there was no clear evidence on people's attitude, perception, and awareness, which continues until now. This study, therefore, intended to assess the perception and attitude of household heads towards enrollment in HI.

The descriptive research design was used and 810 households in Baglung and Kailali Districts of Nepal were selected randomly. The interview schedule used for data collection comprised positive and negative statements at a three-point scale as independent variables to explore the perception and attitude of people towards HI and enrollment in HI as a dependent variable.

Most of the respondents agreed with the statement where attitude and perception were significantly associated with the enrollment in HI. Among the 16 statements, 13 statements were observed statistically significant. Among them: 'anyone can enroll easily in HI', 'primary service point is appropriate', 'contribution amount is appropriate', 'coverage amount is appropriate', 'HI may solve the problem', 'proper dissemination of information, education, communication [IEC] materials may help to enroll', 'health services quality has not been improved after enrollment', 'IEC materials are not appropriate', 'HI related queries are addressed timely', 'relatives/neighbors do/did not request me to enroll', 'complaints are not addressed timely', and 'information is not adequate' were the significantly associated for enrollment in HI.

The perception and attitude of the household heads were significantly associated with the enrollment in HI. The study recommends an appropriate IEC campaign for positive perception and attitudes that leads to better participation in HI. The policymaker may consider the findings while planning the program intervention.

**Keywords:** Attitude, Enrollment, Health Insurance, Perception

### Introduction

Health insurance (HI) is a financial protection and pre-payment system for healthcare services. HI aims to minimize the gap of the utilization of health care between 'haves' and 'haves not' due to financial constrain. The Government of Nepal (GoN) introduced the health insurance program (HIP) in 2016 in three districts of Nepal (Acharya, 2020). And, now the program reached almost all districts except Kathmandu and

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Bhaktapur. However most of the people were unknown and only one out of ten people had adequate knowledge about it (KOICA-Nepal Health Insurance Support Project [NHISP], 2014). Since the HIP is recently introduced and a novel idea for Nepalese people, they may have misperception and misinterpretation regarding HI which may prevent them to enroll. In such instances, people's perception and attitude could be a matter for the success of the program.

'Attitude is a small thing but makes a great difference' is a well-known saying that exists in our society (Ballon & Skinner, 2008). Attitude influences behavior. People generally do not want to change because good behaviour is generally time-consuming, inconvenient, complicated, and even less awarded (Water Aid, n.d.). Adequate information is needed for making a positive attitude and perception. Perception towards the program could have a greater impression (Amo-adei et al., 2016). A study in Kailali shows that only 11 percent of people had heard about health insurance [HI] whereas, only nine percent had good knowledge about it (KOICA-Nepal Health Insurance Support Project [NHISP], 2014).

Nepalese people are yet to be well-informed about HI. The concept of HI is relatively new for Nepal. People are still less known and aware of it (KOICA-Nepal Health Insurance Support Project [NHISP], 2014). Though, United Mission to Nepal had initiated the HI program as Lalitpur Medical Insurance Scheme in 1976. It could not be continued due to a lack of political commitment (KOICA/HIMAL Project, 2012). A study from Kenya shows that having knowledge regarding HI is positively associated with uptake of HI (Maina et al., 2016). Not having proper information may lead to negative perception resulting in poor enrollment in HI.

It is claimed that lack of having knowledge of HI is associated with poor utilization of health care services and delayed the health-seeking behaviour leading to the deterioration of the health condition and productivity as well (Nadpara, 2009). A study from Jordan indicates that parents of differently-abled persons, who had HI, were satisfied but not very much satisfied with the HI services available to them (Altarawneh et al., 2017) which means they were seeking quality health care services. It is supposed that enrollment in HI may protect people from catastrophic health care costs while receiving health services (Maina et al., 2016).

People expect quality health services from health care providers. There are eight dimensions of quality assurance: technical competence; access to services; service effectiveness; human relationship; service efficiency; service continuity; security; and amenities-hygiene/cleanliness (Agustin & Laksmono, 2019). Without a positive attitude or perception, even quality health services become worthless though they are being provided appropriately. Little or inadequate information on HI may lead to unwillingness toward enrollment and negative perception towards HI (Maina et al., 2016).

After the implementation of the social health security program in Nepal, the study has been conducted to find the people's perception and attitude on HI whether people are familiar or not with the program. Therefore, the study aims to examine the association between the people's perception and attitude, and their enrollment in HI.

## Literature review

Attitudes toward HI may be positive even knowledge remains poor (Adewole et al., 2015). However, a high level of knowledge on HI usually leads positive attitude and a higher level of education may not lead to

higher enrollment in HI but higher knowledge on HI results in higher enrollment (Acharya et al., 2019). Misconception and misinformation lead to bad attitudes as well as perception which might result in poor enrollment on HI so a good understanding is a key to ensuring acceptance and participation (Agyei-baffour et al., 2013). It does not always mean that higher education and wealth status are more likely to enroll. A study from Ghana shows that the poorest men and uneducated women were more likely to enroll in HI compared to rich and educated men and women (Dixon et al., 2013).

A low level of perception and attitude about HI creates moral hazards. People may ask for health services even they are not sick. That kind of attitude and perception makes the program unsuccessful (Maina et al., 2016). Adequate information regarding HI must be needed for making a positive effort. A study conducted at Sunsari district on community-based HI shows that just more than half [54%] of the enrolled members were satisfied with the HI program (Subedi et al., 2018).

Socio-demographic characteristics of the subscribers such as residence setting, age, wealth status, and access to media influence the perceived quality of services provided to them in Ghana (Nketiah-Amponsah et al., 2019). 'Attitude does make big differences' even in decision making for treatment-seeking and acceptance of the recommendation of physicians (Orr et al., 2008, p. 150). A study carried out in India shows that treatment seeking for dental care was associated with HI and correlated with patients' acceptance. Where patient's acceptance was associated with patient's positive perception (Joshi et al., 2019). Patients' satisfaction also depends upon the patient's perception and attitude towards the expectation and services provided to them (Otto-sobotka et al., 2019).

Positive attitude and perception, and satisfaction with health services truly support and even sustain the enrollment in HI. Perception towards the program and quality services could have a great impression on the enrollment (Amo-adjei et al., 2016). HI program needs national solidarity especially from the political level, public support, and people's acceptance. Without a positive attitude and perception, and quality health services, it is not possible to operate the HI program successfully. Individuals' characters such as age, health status, perception and socio-demographic factors of the family are significantly associated with the enrollment in HI. Therefore, perception towards insurance is one of the significant predictors for enrollment (Mathur et al., 2015).

People may enroll in HI if they believe the program is potentially beneficial and perceiving of economic benefit (Dixon et al., 2013). Adequate information, education, and communication could lead to a positive attitude and perception and a higher chance of being enrolled (Adewale et al., 2016). A study undertaken in India shows that individual perception toward HI is associated with enrollment (Mathur et al., 2015). We could not find any study regarding perception and attitude and its association with the enrollment of HI in the context of Nepal. Therefore, the study aimed to find out whether there was any association between the individual perception and attitude towards HI and enrollment.

## Methods

### *Research design*

The study used a cross-sectional survey design.

### *Variables*

In this study, socio-demographic characteristics of the respondents, and attitudes and perception towards the HI were taken as independent variables and enrollment in HI was the dependent variable. In the socio-demographic features, some attributes such as caste/ethnicity [Dalit, Madhesi, Muslim, Dasnami, Thakuri as 'others'], religion [Buddhist, Islam and Christian as 'others'], mother tongue [Doteli Aachhami, and others as 'others'], and wealth status [as rich, middle and poor] of the variables were merged due to poor responses though these variables were not further analyzed.

### *Sample and sampling method*

The sample size was calculated by Daniel's formula (Acharya et al., 2019; Naing et al., 2006) adjusting five percent non-response rate as observed in the Nepal Demographic and Health Survey (Ministry of Health et al., 2017) and fifty-fifty prevalence probability of perception and attitude and its association with the enrollment (Acharya et al., 2020; Kothari, 2004).

$$\text{Sample size } (n) = [z^2 p(1-p)]/d^2 \text{ and then, adjusted } n = [n/\text{expected response rate}] = 405$$

*[Where the level of confidence was 95%, response rate 95%, and margin of error 5%]*

The sample size was 405 for both the enrolled family and the non-enrolled family. Therefore, the total sample was 810 families. The list of the enrolled households was obtained from Health Insurance Board [HIB], Districts Offices in Baglung and Kailali districts respectively. The sample was selected by using a simple random sampling method for enrolled households and proximal households were taken for non-enrolled households assuming that proximal households have similar access and utilization of healthcare services. The same method was applied for non-enrolled household samples if more than one household appeared in the proximity of enrolled households. The households enrolled from other organizations than HIB were excluded throughout the research process.

### *Research tool*

The interview schedule was used for data collection. For the validation of the tool, a total of five percent [42 = 21+21] of the total sample were pre-tested in Palpa District. Cronbach's alpha was calculated [Alpha = 0.734] and which was eligible to administer since the score was more than 0.70 which means 73 percent of the variance was reliable (Hair et al., 2014). The attributes of the response of statements were managed as agree, neutral, and disagree [whatever the nearness].

### *Collection of data*

A household-based survey was conducted in Baglung and Kailali Districts of Nepal where the program was initially implemented by the government of Nepal. Data were collected mostly from household heads. All enrolled households were the population of the study. The interview schedule [IS] was administered to collect the data predominantly from the household heads where they felt convenient to respond. In case of rejection or absence of household heads for responses, another member of household was requested. The IS consisted of socio-demographic characteristics of individuals and households, and Likert's type three-point scale statements where one for disagree, two for neutral, and three for agree; for positive, and exactly reverse for negative statements respectively.

### *Analysis of data*

Data were inspected, and edited before entry. We used IBM SPSS Statistics 20 software to analyze the data. Univariate, bivariate and multivariate analyses were used to interpret the data as per the study objective. But only univariate analysis was performed for socio-demographic characteristics of households and individuals.

### *Ethical approval*

For ethical consideration, consent was taken before interviewing the respondents. The research proposal was reviewed for ethical approval from Nepal Health Research Council [Ref. 1807, Reg. no. 473/2017] and approved. The information obtained from the respondents was kept confidential as per the research ethics and guidelines (Nepal Health Research Council, 2011).

## **Results**

### *Socio-demographic characteristics of the respondents*

Since the study was conducted in Baglung and Kailali Districts of Nepal, a total of 70 percent [566] of the household were assigned from Kailali and remains 30 percent [244] were from Baglung District as per the population proportion observed in the census 2011 (Central Bureau of Statistics, 2014).

Table 1: *Socio-demographic characteristics of the respondents (n=810)*

<b>Character</b>	<b>Category</b>	<b>%</b>	<b>No.</b>
District	Baglung	30.1	244
	Kailali	69.9	566
Residence setting	Urban	74.1	600
	Rural	25.9	210
Sex of respondents	Male	49.0	397
	Female	51.0	413
Household head	No	34.1	276
	Yes	65.9	534
The age group of respondents	Up to 25 years	15.1	122
	26 to 50 years	65.6	531
	More than 50 years	19.4	157
Caste/Ethnicity of respondents	Aadibasi/Janajatis	43.5	352
	Brahmin/Chhetry	36.2	293
	Others	20.4	165
Religion	Hindu	91.2	739
	Others	8.8	71
Native language	Nepali	58.3	472
	Tharu	29.8	241
	Others	12.0	97
Literacy status	Illiterate	7.4	60
	Literate	92.6	750
Type of family	Nuclear	41.0	332
	Joint	59.0	478

Character	Category	%	No.
Size of family	Up to 5 members	56.4	457
	More than 5 members	43.6	353
Wealth status	Poor	33.3	270
	Middle	33.3	270
	Rich	33.3	270
Ability to feed	Throughout the year	51.2	415
	6 to 11 months	18.6	151
	Less than 6 months	30.1	244
The family member having chronic diseases	No	65.4	530
	Yes	34.6	280

Source: Field Survey, 2021

Out of the total respondents, 74 and 26 percent were from urban [municipality] and rural [rural municipality] areas. More than half [51%] of the respondents were female and two-third were household heads. Sixty percent of the respondents' age was between 21 to 40 years and the median and mean age of the respondents were 37 and 39±13 years respectively. Forty-four percent of the respondents were Aadibasi/Janajatis and 36 percent belonged to Brahmin/Chhetry. Most of the respondents [91%] were Hindu. Thirty percent of the respondents spoke the Tharu language as their mother tongue and 58 percent of the respondents spoke the Nepali language as their mother tongue. Almost all [93%] respondents were literate. The median and average size of the family were five and 5.6±19 respectively with a minimum of two to a maximum of 14 members. The wealth status of households was divided into 33 percent each from rich, middle and poor. Nearly half [49%] of the respondents could not feed their families throughout the year. Nearly two-thirds of households [65%] had at least one family member having chronic diseases.

#### *Respondents' attitude and perception towards health insurance*

There were 16 statements related to HI. Among them, nine statements were positive and seven statements were negative. The respondents had to respond as disagree, unknown/neutral and agree which would be carrying one, two, and three scores respectively for positive statements and exactly opposite for negative statements. Most of the statements' results seemed as agreed except for the statement 'HI related queries are addressed in time'. Fifty-eight percent of the respondents agreed with the statement 'anyone can easily enroll in HI or there is no problem to enroll' and the mode of the statement was agreed [3] with a composite score of 1900 [2.35]. In the same way, 46 percent of the respondents agreed with the statement 'primary service point is suitable for me' with a score of 1713 [2.11] and the mode of the statement was 'agree' [3]. Fifty-five percent of the respondents agreed with the statement 'contribution amount for HI is appropriate' which score was 1898[2.34] and the mode of the statement was 'agree' [3].

The statement 'coverage amount of HI was appropriate' was agreed by 54 percent of the respondents with a score of 1891[2.33] and the mode of the statement was 'agree' [3]. More than half [53%] of the respondents agreed with the statement 'my family is susceptible to diseases and health problems which score was 1933[2.39] and mode 'agree' [3]. Nearly three fourth [74%] of the respondents were found to agree with

the statement 'there may be financial loss and other problems if any of my family members become sick' with the score of 2153[2.66] and the mode was 'agree' [3]. However, more than one-third [36%] of the respondents expressed that they neither agreed nor disagreed with the statement 'enrollment in HI may solve aforementioned problems' yielding a total score of 1669[2.06] and the mode was 'neutral' [2]. Sixty-three percent of the respondents agreed the statement 'proper dissemination of information, education, and communication materials may help to enroll in HI' with a total score of 2017[2.49] and the mode of the statement was 'agree' [3].

Table 2: Respondents' perceptions regarding health insurance program

Positive Statements (n=810)	Disagree (1)		Neutral (2)		Agree (3)		Score [Mean]	Mode	Result
	No.	%	No.	%	No.	%			
Anyone can easily enroll in HI or there is no problem to enroll.	189	23.3	152	18.8	469	57.9	1900 (2.35)	3 [A]	A
Primary service point is suitable for me.	280	34.6	157	19.4	373	46.0	1713 (2.11)	3 [A]	A
The contribution amount for HI is appropriate.	164	20.2	204	25.2	442	54.6	1898 (2.34)	3 [A]	A
The coverage amount for HI is appropriate.	162	20.0	215	26.5	433	53.5	1891 (2.33)	3 [A]	A
My family is susceptible to diseases or health problems.	113	14.0	271	33.5	426	52.6	1933 (2.39)	3 [A]	A
There may be financial loss or other problems if any of my family members become sick.	63	7.8	151	18.6	596	73.6	2153 (2.66)	3 [A]	A
Enrollment in HI may solve aforementioned problems.	235	29.0	291	35.9	284	35.1	1669 (2.06)	2 [N]	A
Proper dissemination of IEC materials may help to enroll in HI.	113	14.0	187	23.1	510	63.0	2017 (2.49)	3 [A]	A
HI related queries are addressed in time.	361	44.6	281	34.7	168	20.7	1427 (1.76)	1 [D]	D
Negative Statements (n=810)	Agree (1)		Neutral (2)		Disagree (3)				
The health service quality provided by the GoN is not satisfactory.	311	38.4	244	30.1	255	31.5	1564 (1.93)	1 [A]	A
Health services quality has not been improved after the HI program launched	330	40.7	265	32.7	215	26.5	1505 (1.86)	1 [A]	A
Existing IEC materials for HI are not appropriate and sufficient.	379	46.8	229	28.3	202	24.9	1443 (1.78)	1 [A]	A
HI related complaints are not addressed in time.	400	49.4	249	30.7	161	19.9	1381 (1.70)	1 [A]	A
It is not easy to take health services even after enrollment.	422	52.1	220	27.2	168	20.7	1366 (1.69)	1 [A]	A
Relatives or friends did not request/discuss for enrollment.	358	44.2	110	13.6	342	42.2	1604 (1.98)	1 [A]	A



Positive Statements (n=810)	Disagree (1)		Neutral (2)		Agree (3)		Score [Mean]	Mode	Result
	No.	%	No.	%	No.	%			
HI-related information is not adequate from communication media.	383	47.3	196	24.2	231	28.5	1468 (1.81)	1 [A]	A

Note: A= Statement agreed by respondents, N= Neutral, and D= Statement disagreed by respondents

However, 45 percent of the respondents disagreed with the statement 'HI related queries are addressed timely with the score of 1427[1.76] and the mode was 'disagree'[1]. All the respondents agreed to all seven negative statements. However, the scores of the statements were different. Thirty-eight percent of the respondents agreed with the statement 'health service quality provided by the government of Nepal is not satisfactory' with a score of 1564[1.93] and the mode of the statement was 'agree'[1]. Forty-one percent of the respondents agreed with the statement 'health service quality has not been improved even after launching of HI program' with a score of 1505[1.86] and the mode was 'agree'[1]. Nearly half [47%] of the respondents agreed to the statement 'existing information, education, and communication materials for HI are not appropriate and sufficient' which score was 1443[1.78] with mode 'agree'[1]. In the same way, 49 percent of the respondents also agreed with the statement 'HI related complaints are not addressed timely' with a score of 1381[1.70] and the mode was 'agree'[1].

More than half [52%] of the respondents agreed to the statement 'it is not easy to receive health services even after enrollment' with a score of 1366[1.67] with a mode 'agree'[1]. In the same way, more than half [54%] of the respondents were found to agree with the statement 'relatives or friends did not request/discuss for enrollment' which score was 1604[1.98] and the mode of the statement was 'agree'[1]. Less than half [47%] of the respondents agreed with the statement 'HI related is not adequate from communication media' with the score of 1468[1.81] and the mode was 'agree'[1].

#### *Association of people's attitude and perception with enrollment in health insurance*

Almost all statements were associated with the enrollment in HI and 13 out of 16 statements were statistically significant in bivariate analysis. Sixty-three percent of the respondents who agreed with the statement 'anyone can easily enroll in HI or there is no problem to enroll' were enrolled compared to 42 percent of those who disagreed with that statement ( $p < 0.001$ ). Similarly, 60 percent of the respondents were enrolled and agreed with the statement 'primary service point is suitable for me' against 46 percent of those enrolled but disagreed with that statement ( $p < 0.001$ ). In the same way, 60 percent of the respondents who agreed the statement of 'contribution amount of HI is appropriate' were enrolled compared to 43 percent of those who disagreed with that statement ( $p < 0.001$ ). Fifty-nine percent of the respondents who agreed to the statement 'coverage amount for HI is appropriate' were enrolled compared to 46 percent of those who disagreed with that statement ( $p < 0.001$ ). The majority of the respondents agreed with the statements 'my family is susceptible to diseases or health problems'; 'there may be financial loss and other problems if any of my family members become sick'; and 'proper dissemination of information, education and communication materials may help to enroll in health insurance' but not statistically significant.

Fifty-nine percent of the respondents who agreed with the statement 'enrollment in HI may solve aforementioned problems' were enrolled compared to 53 percent of those who disagreed with that statement ( $p<0.001$ ). But, 57 percent of the respondents who disagreed with the statement 'health service quality provided by the government of Nepal is not satisfactory' were enrolled compared to 51 percent of those who agreed with that statement ( $p<0.001$ ). Nearly two-third [65%] of the respondents who disagreed with the statement 'health services quality has not been improved even after HI program launched' were enrolled compared to 52 percent of those who agreed on that statement ( $p<0.001$ ). Likewise, 58 percent of the respondents who disagreed with the statement 'existing information, education, and communication materials for HI are not appropriate and sufficient' were enrolled compared to 52 percent of those who agreed with that statement ( $p<0.001$ ). A two third [67%] of the respondents who agreed to the statement 'HI-related queries are addressed timely' were enrolled compared to 49 percent of those who disagreed with that statement ( $p<0.001$ ).

Fifty-eight percent of the respondents who disagreed with the statement of 'HI related complaints are not addressed timely' were enrolled compared to 52 percent of those who agreed with that statement ( $p<0.001$ ). Similarly, fifty-nine percent of the respondents who disagreed with the statement 'it is not easy to take health services even after enrollment' were enrolled compared to 54 percent of those who agreed with that statement ( $p<0.001$ ). In the same way, 64 percent of the respondents who disagreed with the statement of 'relatives or friends did not request/discuss for enrollment' were enrolled compared to 39 percent of those who agreed with that statement ( $p<0.001$ ). Likewise, 60 percent of the respondents who disagreed with the statement of 'HI related information is not adequate from communication media' were enrolled compared to 49 percent of those who agreed with that statement ( $p<0.001$ ).

Table 3: Respondents' feelings and perception towards health insurance and enrollment in health insurance cross tabulation

Statements	Response Category	Enrollment in health insurance				Total	p value
		No		Yes			
		N	%	N	%		
Anyone can easily enroll in HI or there is no problem to enroll.	Disagree	110	58.2	79	41.8	189	<0.001
	Neutral	122	80.3	30	19.7	152	
	Agree	173	36.9	296	63.1	469	
The primary service point is suitable for me.	Disagree	151	53.9	129	46.1	280	<0.001
	Neutral	106	67.5	51	32.5	157	
	Agree	148	39.7	225	60.3	373	
The contribution amount for HI is appropriate.	Disagree	94	57.3	70	42.7	164	<0.001
	Neutral	136	66.7	68	33.3	204	
	Agree	175	39.6	267	60.4	442	
The coverage amount for HI is appropriate.	Disagree	87	53.7	75	46.3	162	<0.001
	Neutral	139	64.7	76	35.3	215	
	Agree	179	41.3	254	58.7	433	
My family is susceptible to diseases or health problems.	Disagree	58	51.3	55	48.7	113	0.121
	Neutral	148	54.6	123	45.4	271	
	Agree	199	46.7	227	53.3	426	
There may be financial loss and other problems if any of my family members become sick.	Disagree	30	47.6	33	52.4	63	0.115
	Neutral	87	57.6	64	42.4	151	
	Agree	288	48.3	308	51.7	596	
Enrollment in HI may solve the aforementioned problems.	Disagree	111	47.2	124	52.8	235	<0.001
	Neutral	177	60.8	114	39.2	291	
	Agree	117	41.2	167	58.8	284	
Proper dissemination of IEC materials may help to enroll in HI.	Disagree	53	46.9	60	53.1	113	0.266
	Neutral	103	55.1	84	44.9	187	
	Agree	249	48.8	261	51.2	510	
The health service quality provided by the GoN is not satisfactory.	Agree	151	48.6	160	51.4	311	<0.001
	Neutral	145	59.4	99	40.6	244	

Statements	Response Category	Enrollment in health insurance				Total	p value
		No		Yes			
		N	%	N	%		
The health services quality has not been improved after the HI program launched.	Disagree	109	42.7	146	57.3	255	<0.001
	Agree	158	47.9	172	52.1	330	
	Neutral	171	64.5	94	35.5	265	
	Disagree	76	35.3	139	64.7	215	
Existing IEC materials for HI are not appropriate and sufficient.	Agree	177	46.7	202	53.3	379	<0.001
	Neutral	144	62.9	85	37.1	229	
	Disagree	84	41.6	118	58.4	202	
HI-related queries are addressed in time.	Disagree	184	51	177	49	361	<0.001
	Neutral	165	58.7	116	41.3	281	
	Agree	56	33.3	112	66.7	168	
HI-related complaints are not addressed in time.	Agree	191	47.8	209	52.3	400	<0.001
	Neutral	147	59	102	41	249	
	Disagree	67	41.6	94	58.4	161	
It is not easy to take health services even after enrollment.	Agree	194	46	228	54	422	<0.001
	Neutral	142	64.5	78	35.5	220	
	Disagree	69	41.1	99	58.9	168	
Relatives or friends did not request/discuss for enrollment.	Agree	218	60.9	140	39.1	358	<0.001
	Neutral	65	59.1	45	40.9	110	
	Disagree	122	35.7	220	64.3	342	
HI related information is not adequate from communication media.	Agree	196	51.2	187	48.8	383	<0.001
	Neutral	116	59.2	80	40.8	196	
	Disagree	93	40.3	138	59.7	231	

## Discussion

The respondents overall agreed since the average score was 2.28, where one represents 'disagree', two 'neutral', and three 'agree' for positive statements and the mean score of the negative statements was 1.82 where one refers to 'agree', two 'neutral', and three 'disagree'. So it can be concluded that the respondents agreed in both positive and negative statements which showed that the perception was associated with enrollment in the HI program. Individuals' attitude influences decision making and behaviour change as well. Misconception or misinformation regarding HI could lead to negative attitudes and poor participation (Agyei-baffour et al., 2013) since most of the people were unaware of it (Health Research and Social Development Forum [HERD], 2016). Sometimes general prediction may be a failure that educated and wealthy people may be expected to have more knowledge as well as more enrollment but it does not always be true (Dixon et al., 2013). So it needs further study to predict.

Universal health coverage [UHC] is a global concern and targeted to be achieved by 2030 (Department of Health Services, 2019) and as per the national health policy and insurance policy (Ministry of Health (MoH), 2017; National Health Sector Programme, 2014) and constitutional mandate (The Constitution of Nepal, 2015), the government is under pressure to implement the HI program. But one-fourth of the people are still unknown about it (Acharya et al., 2019). It is challenging to implement since a mass population is still unaware of it. Therefore, positive attitude and perception are prerequisites for the success of the program (Yin et al., 2019).

A study shows that more than 13 percent of people did not want to enroll because they felt that they were healthy (Machlin & Carper, 2005). In such instances, enrollment may be hard. HI packages should be competitive in the market. But in the context of Nepal, the government has initiated the program however HI from private sectors may influence the program since they may enter the community with a very creamy message which may attract the people quickly. Then, HIB may face the problem of poor enrollment and sustainability of the program since just over a quarter (28%) service receivers were satisfied by the health services provided by the government compared to 56 percent from private sectors (Acharya et al., 2018; KOICA-Nepal Health Insurance Support Project [NHISP], 2014). The same observation was seen in Nigeria (Morrison & Legaaga, 2017). In such a context, people may neglect the program considering poor satisfaction and negative attitude and perception of government health services.

Ghana's experience shows that HI subscribers from the rural area were more satisfied compared to subscribers from the urban area and access to mass media was found to be a significant predictor for perceived quality of health services (Nketiah-Amponsah et al., 2019). Another study shows that ever enrolled households were comparatively more negative towards HI compared to those who were never insured (Kwasi et al., 2018). It shows that even an insured family may have a negative perception of HI. The perception may be shaped by the experiences of treating differently while receiving the health services that lead to HI mechanism attractive or not attractive (Kwasi et al., 2018).

Quality health services need both a positive attitude and satisfaction of receivers as well as providers. A study from Morocco shows that most of the physicians were dissatisfied regarding mandatory HI (Zegraoui

et al., 2018). Then how they provide quality services to the patients. It may create a patient's dissatisfaction and negative perception and attitude towards the HI program. Therefore, not only the receiver but also the provider should be satisfied with the program which may assure quality health services. Another study from India shows that 87 percent of nurses had favorable and 13 percent had unfavorable attitudes reading HI scheme (Kaklottar & Sarate, 2019). Same results were observed in USA that most of the cancer survivors were satisfied with the quality and coverage of the insurance package (Park et al., 2016).

People's hesitation to participate in government-operated HI programs globally. An experience from Nigeria shows that just more than half [53%] of the respondents agreed to participate in the HI scheme. Similarly, poor knowledge and a fair joining attitude were also observed (Olugbenga-Bello & Adebimpe, 2010). But another study in that country shows that patients had high level of satisfaction regarding various health services received at hospitals (Garba et al., 2018).

A study in Uganda shows that 58 percent of the respondents did not know HI. Similarly, 43 percent of them did not know the importance, 43 percent of them knew about HI from insurance agents, 13 percent were covered by HI policy, 60 percent disagreed about the importance of HI to them, 78 percent expressed it as hard to understand, 55 percent agreed that HI is suitable for older people (Esther, 2018). All these data show that HI is considered as an asset of choice not a compulsion for all. Another study from Ethiopia shows that 55 percent of the households were satisfied with community-based HI, which was significantly associated with the knowledge on HI of benefits packages (Kebede & Geberetsadik, 2019) and suggested for information, education and communication campaigns to aware people.

Community-based HI has very a good impact in Bangladesh. It showed overall satisfaction in terms of health services however, it could be a chance of more improvement (Sarker et al., 2018). Such satisfaction makes people positive towards enrollment in HI and supports the global agenda of UHC. However, insurers were unsatisfied due to unclear terminology, high costs, and complexity of calculation of assets, unable to change the plan within a year. Such provision could make consumers anxious and feeling of wrong decisions that might lead to negative perception and attitude towards HI (Houston et al., 2016). A study from Ghana supports the study that there was a significant difference between the perception of health services quality between insured and non-insured clients where they expected more quality of health services than they received (Opoku, 2018). HI literacy and positive perception towards HI was a significant predictor for enrollment in HI and a low level of HI literacy was associated with the low level of enrollment (Norbeck, 2018) which also supports the study.

#### *Policy implication*

The study shows that positive perception towards HI leads to better enrollment in the HI program. Higher participation in the HI could lead to financial sustainability for health sectors and may fill the gap of inadequate budgets for healthcare and reduce the gap of utilizing healthcare services by rich and poor. It may lead to meet the targets of health and wellbeing for all, universal health coverage as well as ensuring the constitutional mandate of Nepal. Therefore, adequate information, education, and communication-related interventions are needed for better understanding and positive perception towards HI.

## Conclusion

Perception and attitude play vital roles in HI especially in promoting HI. As this study shows, the respondents agreed to most of the positive statements whereas they agreed on a few negative statements. Moreover, both the perception and attitude towards HI were found significantly associated with enrollment in HI. However, as the respondents expressed, they believed that enrollment in HI was not adequately managed to solve all types of health or disease-related problems. Nevertheless, various studies including this one showed that dissemination of appropriate and adequate information on HI was beneficial in making people positive about it.

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## Author contributions

Conceptualization: Acharya, Devkota, Bhattarai, methodology: Acharya, Devkota; Software: Acharya; Validation: Acharya, Devkota; Formal Analysis: Acharya, Devkota; Investigation: Acharya, Devkota, Bhattarai; Data Curation: Acharya, Bhattarai; Writing – Original Draft: Acharya; Writing – Review & Editing: Acharya, Devkota, Bhattarai; Visualization: Acharya, Bhattarai; Supervision: Devkota

## Disclosure Statement / Conflict of interest

The authors declare no conflict of interest.

## Ethical statement

The research proposal was reviewed for ethical approval from Nepal Health Research Council [Ref. 1807, Reg. no. 473/2017].

## Data deposition

Data will be available upon reasonable request from the corresponding author.

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# **Determinants of repayment behaviour of MFI clients in the context of COVID-19: a case study of Lalitpur District, Nepal**

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## **Abstract**

This paper investigated factors affecting repayment performance of MFI clients in the context of COVID-19. Business characteristics, borrowers' characteristics and lenders' behavior were identified and predictors of loan repayment. A telephone interview using a full-fledged questionnaire was conducted among randomly chosen 160 loan clients of various microfinance institutions in Mahalaxmi municipality of Lalitpur district during Covid 19 pandemic (June-July, 2020). The descriptive statistics, correlation analysis, binary logistic regression analysis analyzed the data and qualitative analysis is done to support the result of research. The finding of study reveals that age of the borrower, educational level of borrowers, types of the business and profit generated business influence the repayment of loan. However, family size, skills, age of business, work performance, transparent communication and clarity of MFI policy does not have any impact on repayment of loan. COVID-19 pandemic has affected all types of business and created poor cash flow in the market and due to lockdown, the source of income has been decreased which causes large number of delay repayment of monthly installment is decrease in profit due to decrease in revenue of the business.

**Keywords:** Microfinance, MFIs, Loan Repayment, Covid 19 and Nepal

## **Introduction**

Microfinance supplies credits and other financial services to small economic units and micro-enterprises to unleash their potentiality of generating income as opposed to consumption. It plays a role in helping some households make different inter-temporal choices in consumption and serves as engine of growth to fuel business creation (Banerjee et al., 2015). Microfinance Institutions are the specialized types of institutions promoting income generating activities of the poor by providing banking and financial services and thereby contributing in the upgrading their economic and social standards (Nepal Rastra Bank, 2013).

While almost every sector of the economy has felt the brunt of Covid-19, low income households and small businesses are disproportionately affected because of having little savings and assets to help them cope with shock created by the current pandemic (Shrestha, 2020). The COVID-19 pandemic threatens lives and livelihood, and with that has created immediate challenges for institutions that serve affected communities. Lockdown due to COVID -19 pandemic has decreased household income due to decrease in business sales. MFIs are suffering from both a lack of repayments and a lack of access to capital and liquidity from funders (Malik, et al., 2020). In Nepal, the first case of COVID-19 was confirmed on 23 January who had returned from

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China on 9 January 2020. On 19th March, Government of Nepal had declared lockdown where all government and private offices were closed except which provide essential services. Sinha and Dhakal (2020) found that COVID-19 lockdowns posed challenges for collections of repayment from clients for a limited period of time. They stated that service sectors such as hotels/restaurants, beauty parlours, hair salons were highly affected by the pandemic. Because lockdown conditions, it had been difficult for microfinance institutions to manage their business as their clients were suffering from business or income loss.

In the mid of May 2020, average loan delinquency of all microfinance institutions reached to almost 48 percent of total loan outstanding (NRB, 2020). Nepal Microfinance Bankers' Association (2020) conducted the survey in regards to impact of Covid 19 on microfinance among Chief Executive Officers of 54 MFIs. The report stated that all sectors of MFIs' loan portfolio were affected and MFIs believed that clients lost their income due to loss of their business (Shrestha, 2020).

### *Objectives*

This paper aimed to determine the factors influencing loan repayment of MFI clients in the context of COVID-19. Below are the specific objectives of this study:

To investigate the characteristics of clients that affect the repayment of loans in MFIs

To analyze the business characteristics that influence loan repayment in MFIs.

To explore lender's behavior that contributes to loan repayment among MFIs' clients.

### *The Hypotheses*

H<sub>1</sub>: There is significant relationship between client characteristics and loan repayment among microfinance loan beneficiaries.

The demographics of a client is taken as an important determinant to analysis their ability to payback loan. The financial or credit officer will determine whether consumers are going to make the lowest attempt to meet their credit obligations. The client characteristics are age, gender, level of education, number of dependents a client support financially and their skills.

H<sub>2</sub>: There is significant relationship between business characteristics and loan repayment among microfinance loan clients.

Business characteristics relate to the nature and type of the business and its performance in relation to the others in the environment. They include the size and age of the business; income and profits generated from the business.

H<sub>3</sub>: There is significant relationship between lenders' behavior and loan repayment among microfinance loan clients.

Lender's behavior is defined as loan officer and MFIs behaviors towards their clients. It includes clarity about the credit policy, transparent communication with their clients and work performance of MFI. It is believed that loan repayment is also determined by behavior of MFIs towards borrowers.

## **Review of literature**

Loan repayment usually had devastating effect on both loan borrowers and the institutions that issue the loan. For the borrowers, delay loan repayment and default may not only loss of their properties but also it

makes difficulty for them to access future loan. Loan repayment default is risk presented to an institution by a borrower failing to repay at least three installments within a period of one month which indicates of increase risk that a borrower will certainly fail to make all the repayment and automatically fail to repay loan (Pearson & Greeff, 2006). Similarly, Phillips and Vander Hoff (2004) define loan repayment default as a failure to repay the interest or principal of loan by a borrower when debt is due.

Ghatak and Guinnane (1999) analyzed the four problems face by formal credit institutions that lend to poor borrower who cannot offer much in the way of collatera: adverse selection, moral hazard, costly audits and enforcement. Ghatak and Guinnane showed simple model of lending how joint liability affect group formation, induces group members to influence the way other members select their project, helps the lender avoid costly audits, and gives encourages borrowers to repay their loans without the lender imposing costly sanctions. Conning (1996) analyzed in these issue suggests that sustainability could indeed be difficult to achieve many circumstances. Ghatak and Guinnane concluded with examples in study that slight modifications of the rules that robbed grioup lending of the joint-liability aspect that accounts for the high repayment rates.

Warue (2012) conducted research with MFI sepcific factors: Corporate governance, loan process and procedures, default recovery methods, SHGs specific factors: group governance, member screening process, default recovery methods, external factors: sociopolitical instability, economic downturn, weather conditions, inability to enforce. survey research design was used and a census of the 49 MFIs was taken, data was collected through a self developed structured questionnaire and administered to MFIs loan officers for response, Multiple regression analysis was used to establish relationship between loan delinquency and microfinance institutions. Microfinance institutions and self help groups' specific factors and external factors significantly affect loan delinquency performance among microfinance institutions in Kenya.

Nguta and Huka (2013) conducted research on factors influencing loan repayment default in microfinance institutions: the experience of Imenti District, Kenya and data were collected using both structure and unstructured questionnaire and were used descriptive and inferential statistics. Business characteristics include the size, age, type, location of business and profit generated from business which influence loan repayment default by clients. He found that high default cases were common on manufacturing than service industry, agriculture and trade sectors. And business located within the municipality had high loan repayment default rates as compared to business outside municipality. He also found that there was significant relationship between type of business, age of the business, number of employees and business profit with loan repayment default.

Solomon and Addisu (2013) studied on determinants of rural household's loan repayment performance: case of Oromia Credit and Savings Share Company (OCSS) and Keleta Saving and Credit Union (KSCU) in Dodota Woreda in Oromia regional state, this study employed logistic regression analysis and the result shows that age, sex, number of oxen owned, land holding size and loan supervision were positively and significantly influence followers to pay full and timely loan. Againe and Waari (2014) conducted research on factors influencing loan repayment in microfinance inatituition in Kenya with 360 loan borrowers and 39 loan officers of microfinance. The data were collected through structured and unstructured questuonnaires and interviewed and analysed using both descriptive and inferential statistics and also used logistic regression to

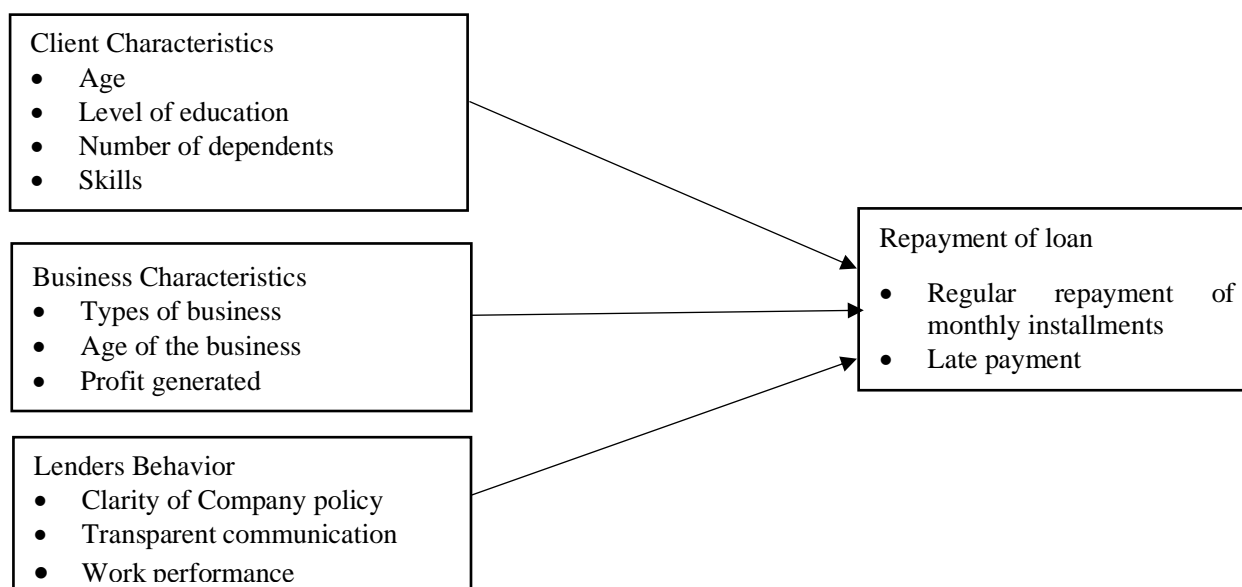
conclude their findings. Againe and Waari stated that various factors related to clients' characteristics: educational level, age, gender, hobbies; business characteristics: length of operation, management members, type of business and lender's characteristics: group handled, period taken to qualify new member and criteria used to evaluated credit worthiness, had significant impact on loan repayment with the controlling mechanism of the microfinance institutions.

According to Giri and Shah (2019), various microfinance institutions in Nepal had been providing micro loans without any collateral facilities to the economically challenged people in the country. Due to delayed loan repayment, timely loan repayment was a major concern for Nepalese MFIs. There are various factors that influence the borrowers to repay the monthly installments on time such as business characteristis, lender characteristics, client characteristics and loan repayment. Simple random sampling technique is used, inferential analysis and logistic regression is used for data analysis. The study was done with 120 borrowera and for qualitative 3 MFI officers of Bhaktapur district Nepal. The study revealed that there was significant impact of annual profit earned and nature of communication of loan officers with the loan repayment.

Pandey and Ojha (2020) stated that the COVID-19 pandemic had posed unprecedented both challenges to both health and economic sectors. In Nepal, as in many other developing countries, MFIs were at forefront of provideing financial services to the low-income population, but due to lockdown farmers are unable to sell their produced product or they are forced to sell their produced product at low price and also many small enterprises were unable to operate their business with uncertainty. It reflected in the delinquency in repayment due to decrease in client's income. Due to lockdown, MFIs were not able to conduct regular center meetings with clients to carry out transation and further NRB had given a three-month moratorium up to mid-july 2020 to all borrowers which would delay the loan repayments.

On the above literature, this paper focuses on the evaluating the relationship of explanatory variables of loan repayment like client characteristics, business characteristics and lender's behavior with loan repayment behavior. Figure 1 provides conceptual framework for this study that is followed by hypotheses.

**Figure 1: Conceptual framework of the study**



## Methodology

The study is both quantitative and qualitative in nature. The study follows explanatory research design to identify and confirm the relationship (as stated in the hypothesis) between independent variables: client characteristics, business characteristics, lenders' behavior and dependent variable: Repayment of loan. A deductive approach of scientific research is used to carry out this study. According to Bryman and Bell (2015), deductive theory is common view of the relationship between theory and research and the researcher, on the basis of what is known about a domain and the theoretical considerations within it, deduces a hypothesis or hypotheses that must be subjected to empirical scrutiny.

Among 276 municipalities, Mahalaxmi municipality is selected for this study which is situated in the north-eastern part of the Lalitpur district. Convenience sampling technique is used to conduct the survey. The population of this study are the entire loan borrowers of microfinance institutions of Lalitpur Mahalaxmi Municipality area which cannot be determined exactly at the COVID- 19 pandemic, so the convenience sampling method is used. The researcher took 160 samples of different places of Mahalaxmi municipality to cover the key characteristics of the study. Data is collected using structured questionnaire that has been administered with the help of related literature of previous researchers. Due to COVID-19 pandemic and lockdown in the country, phone survey has adopted for the collection of primary data. Microfinance institutions has helped in this research by providing detail of loan borrowers which makes easier in this research for data collection. A set of structured questionnaires has been asked to loan borrowers by phone. The data collected from the primary sources are summarized and presents in the forms of tables and charts by various test and tools.

Descriptive analysis and binary logistic regression analysis are carried out for the analysis purpose. Binary Logistic Regression is a type of regression technique used to study the relation between a dependent and one or more independent variables, when the dependent variable is categorical. Logistic regression is used to describe data and to explain the relationship between dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables. At the center of the logistic regression analysis is the task estimating the log odds of an event (Swamy, 2019). Mathematically, logistic regression estimates a multiple linear regression function defined as:

$$Z = \log \left[ \frac{p_i}{1 - p_i} \right] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \dots + \beta_k x_k$$

Linear Probability Model is defined as:

$$P_i = \beta_0 + \beta_1 x_i$$

Where  $P_i$  = probability of occurrence of event

If  $X$  has no upper or lower bound, then for any value of  $\beta$  there are values of  $X$  for which either  $p_i > 1$  or  $p_i < 0$ . This is contradictory, as the true values of probabilities should lie within the (0, 1) interval.

$$\text{Odds} = \frac{P_i}{1 - P_i}$$

Where,  $P_i$  = Probability of event

$$1 - P_i = \text{Probability of non-event.}$$



### Definition of Variables

Variables	Definition
Repayment of Loan	- Regular repayment of monthly installment (1) and late payment of monthly installment (0).
Client Characteristics	<ul style="list-style-type: none"> <li>- Age: Age of the borrowers (18-30 years = 1, 31-40 years = 2, 41-50 years = 3, and above 50 = 4).</li> <li>- Level of Education: Education level of borrowers (SLC or below = 1, +2/Intermediate = 2, Bachelor = 3, and Master and above = 4).</li> <li>- Number of Dependents: Number of dependent family members (1 to 2 = 1, 3 to 5 = 2, 6 to 10 = 3, and 10 and above = 4).</li> <li>- Skills: Skills that learn before starting the business (1=Yes, 0=No).</li> </ul>
Business Characteristics	<ul style="list-style-type: none"> <li>- Types of Business: Types of a business that borrowers are operating (Manufacturing=1, Trade=2, Service=3, and Agriculture=4)</li> <li>- Age of the Business: The period of operation of borrowers' business (Less than 2 years = 1, between 2 and 5 years = 2, between 5 and 10 years = 3, and more than 10 years = 4).</li> <li>- Profit Generated: Monthly profit generated by borrowers' business (below 10000 = 1, between 10001 and 50000 = 2, between 50001 to 100000 = 3, and above 100000).</li> </ul>
Lenders' Behavior	<ul style="list-style-type: none"> <li>- Clarity of Company: Clarity about company's policies by borrowers (1 = satisfied and 0 = dissatisfied)</li> <li>- Transparent Communication: Transparent communication of loan officer with their client about terms and condition of services (1 = satisfied and 0 = dissatisfied)</li> <li>- Work Performance: Work performance of Microfinance institutions for collection of installments with their clients (1= satisfied and 0 = dissatisfied).</li> </ul>

## Results and discussion

### *Clients Characteristics*

**Age:** Out of total respondents 160, 18.1% of respondents belongs to 18 to 30 years of age group. 44.4% of total respondents (i.e., 71 out of 160) belongs to 31-40 years age group, 28.7% of total respondents (i.e., 46 out of 160 respondents) belongs to 41-50 age group and 8.8% of total respondents (i.e., 14 out of 160 respondents) belongs to 50 and above age group. Most of the microfinance loan borrowers belong to age group between 31 and 40.

**Number of Dependents:** Family size indicate the number of persons the respondent support financially. The number of dependents may have an effect on the family income and expenditure which could ultimately affect the loan repayment of microfinance institutions. The study shows, 15% of respondents have 1 to 2 dependent member and 73.1% of respondents have 3 to 5 dependent member and rest 11.9% of total

respondents have 6 to 10 dependent members in their family. So, most of the respondent have 3 to 5 dependents in their family whom they have to support financially.

**Level of Education:** The study established that majority (76.3%) of the respondents has SLC or below education. Respondent with +2 or intermediate educational level are 22.5% out of total respondents and only 1.3% out of total respondents have Bachelor or university level education. This implies that majority of the respondents have primary and secondary level of education which could be important in the success of the business and contribute to increase business income and influence them for timely repay their loan installments.

**Skills:** The study shows most of the respondents started their business without taking any training and without having skills and knowledge about their business, the response rate is 58.8% out of total respondents. And 41.2% of total respondents have taken training and learn the skills that necessary for their business. The skills and training such as tailoring, driving, handicraft and so on has taken by respondents.

#### *Business Characteristics*

Business characteristics includes the type of business, age of the business and the profit earned by business also whether the profit earned by business is sufficient to repay their monthly installment.

**Types of Business:** 50% of total respondents are engaged in trade business, 26.9% of respondents operated services business while 14.4% of respondents are engaged in agriculture and 8.8% of total respondents operated manufacturing business. Most of the respondents are engaged in the trade business such as grocery shop, readymade shoes store, cosmetic shops and fancy clothes stores and retail vegetables and fruits shop. After trade business some of the borrowers are engaged in service business such as driving tempo, tailoring business and beauty parlor.

**Age of the Business:** the study shows that 34.4% of respondents has their business running for duration of between 2 and 5 years and 31.3% of the respondents has operated their business for duration of between 5 and 10 years, 17.5% of the respondents has been operating their business more than 10 years and only 16.9% of the total respondents who has operated their business for less than 2 years. This indicate that most of respondents has their business operation period between 2 and 5 years; and 5 and 10 years. The new business which are less than 2 years has start up challenge and old businesses have overcome start-up challenges and increases the revenue which ultimately affect the loan repayment of microfinance institutions.

**Business Profit:** Business profit is the main factor that influence in timely repayment of loan and monthly installment. The study reveals, 62.5% of the respondents have business profit between NRs. 10001 and NRs. 50000 and 31.9% of the respondents have business profit between NRs. 50001 and NRs. 100000, 5% of total respondents earn more than NRs. 100000 per months and only 0.6% of respondents earn less than NRs. 10000 per months. The study shows that most of the respondents earn profit between 10001 and NRs. 50000 and also between NRs. 50001 and NRs. 100000. According to previous researcher Againe and Waari, (2014) it was clear that the more profitable a business is easier for business to repay their loan on time and business with less profitable has to struggle between reinvesting the profit back into the business and repay loan so it increases the rate of loan repayment default.

### *Lenders' Behavior*

The response of the respondents with clarity of policy, transparent communication, and work performance of microfinance and repayment of loan is shown in Table 1. The descriptive analysis includes total number of respondents, minimum value, maximum value, mean and standard deviation of the variables.

**Table 1: Lenders Behavior and Repayment of Loan**

	N	Mean	Std. Deviation
Clarity of Policy	160	3.9521	.54925
Transparent communication	160	4.1312	.56214
Work performance	160	4.0833	.45634
Repayment of loan	160	4.1672	.42125

Table 1 shows mean and std. deviation of the variables. The mean of clarity of policy is 3.9521 which states that the respondents are clear about the rules and regulation and policy of the microfinance institutions and they are aware about the microfinance policy. The standard deviation represents the variation in respondent's answer which is 54.925%. The mean of transparent communication is 4.1312 which means respondents are highly satisfy with the loan officer that they show clear and transparent documents about interest rate, product prices and clearly communicate the terms and conditions about all financial services and loan officer deals with the borrowers based on their knowledge and understandings. The standard deviation represents the variation in respondent's answer which is 56.214 percent. The mean of work performance is 4.0833 which means that respondents are highly satisfy with the work performance of microfinance institution such as remind their client about payment of installment and provide proper monitoring and follow-up by authorities about loan. The standard deviation represents the variation in respondent's answer which is 45.634 percent. The mean of repayment of loan is 4.1672 which means that respondents are highly influence by profit generated by business, knowledge and skills and overall lender's behavior to repay loan on time. The standard deviation represents the variation in respondent's answer which is 42.125 percent. Hence, respondents are highly satisfying with lender's behavior and that helps them to repay loan on time.

### *Logistic Regression Analysis*

Logistic regression is used to find out the factors influencing loan repayment behavior of MFIs' clients.

**Table 2: Predictive capacity of the logistic regression model**

Observed		Predicted		
		Repayment of Loan		Percentage
		Delay Repayment	Timely Repayment	Correct
Repayment of Loan	Delay Repayment	110	7	94.0
	Timely Repayment	34	9	20.9
	Overall Percentage			74.4

Cox and Snell R Square	0.128
Nagelkerke R Square	0.187

Table 2 shows 117 respondents out of total 160 respondents pay delay monthly instalment, and 43 respondents pay their monthly instalment on time. So, the overall predictive capacity model is 74.4% i.e., this model will support the statement that claims that there is delay repayment of monthly installment by the borrowers by 74.4% in the COVID-19 pandemic. Because of COVID-19 pandemic, it effect all type of business which ultimately lower the income of borrower so its causes the delay repayment of monthly installment. The value of Nagelkerke R square is obtained as 0.187 which means that 18.7% of variation in the dependent variable is described by the independent variables.

**Table 3: Logistic regression analysis for loan repayment**

	B	S.E.	Wald	Sig.	Exp(B)
Age	.585	.303	3.727	.054	1.794
Education	.763	.436	3.068	.080	2.144
Number of Dependents	.073	.435	.028	.868	1.075
Skills	-.007	.434	.000	.987	.993
Types of Business	.510	.249	4.183	.041	1.665
Age of Business	.073	.278	.070	.792	1.076
Profit	.783	.341	5.259	.022	2.188
Clarity of Policy	.523	.491	1.135	.287	1.687
Transparent communication	-.058	.404	.021	.886	.944
Work performance	-.735	.605	1.477	.224	.479
Constant	-5.770	2.546	5.135	.023	.003

The result from logistic regression, p-value of type of business is less than 0.05 (i.e., 0.041) so there is significant relationship between type of business of client and timely repayment of monthly installment and regression coefficient is 0.510, it means there is positive relationship between type of business and repayment of loan. As expected, the result shows that there is significant relationship between business profit and repayment of loan and positive coefficient shows the direct relationship between business profit and repayment of loan. Thus, as the business profit increases the ability of the client of repayment of loan also increases. Moreover, age and education also affect the loan repayment behavior of microfinance clients but the coefficients are significant at 10 percent level of significance only. However, skills, age of business, clarity of policy, transparency in communication and work performance have no effect on the loan repayment behavior during Covid-19 pandemic.

The expected B-value gives the odds ratio that gives the relative measure of effect of the independent variable with the repayment. If the value is greater than 1, then the odd of an outcome occurring increases and if the value is less than 1, any increase in the predictor variable leads to a drop in the odd of the outcome occurring (Mbachu, Nduka, and Nja, 2012). From table 3, the odd ratio of number of dependents is 1.075, it means when the predictor is raised by one unit, will increase level of sustainability by 1.075 times. And skills

odd ratio is 0.993 which implies that the borrowers are 0.99 times likely to default on loan repayment because of negative correlation between skills and loan repayment. Similarly transparent communication and work performance's odd ratio are 0.944 and 0.479 respectively it means the borrowers are likely to default on loan repayment because of negative correlation with loan repayment and transparent communication and work performance.

Consistence with the previous study (Againe & Waari, 2014), this study revealed that there is significant relationship between client characteristics such as age of loan borrowers, educational level of borrowers and family with loan repayment of loan., the current study also found that there is significant relationship between client characteristic: age and the educational level with loan repayment and also there is positive relationship of age, educational level with repayment of loan. But there is no significant relationship between number of dependents in family and skills learn before starting their business with repayment of loan of microfinance institutions that means the family size and skills does not influence microfinance institution's borrower to repay their loan.

The study of Naguta and Huka (2013); Againe and Waari (2014); and Giri and Shah (2019) found that there is significant relationship between business characteristics: types of business and profit of the business with repayment of loan and also they revealed that there is no relation between age of the business and repayment of loan. Supporting their findings, current study also found that there is significant relationship between types of the business and profit of the business with loan repayment of loan and there is no relationship between age of the business with loan repayment of loan. Warue (2012) revealed that there is significant relationship between lenders' characteristics and repayment of loan. Similarly, Giri and Shah (2019) also found that there is significant relationship between communication with clients and repayment of loan but there is no relationship between MFI policy and repayment of loan. On the contrary, the current study found that there is no relationship between repayment of loan and lender's behavior of microfinance institutions, it means that clarity of policy, transparent communication and work performance of microfinance institutions do influence on repayment of loan.

The repayment rate of current study is lower than the immediate study done by Giri and Shah (2019) in Nepal. The result is inconsistence because of COVID-19 pandemic, it effects all type of businesses which ultimately lower the income of borrower so its causes the delay repayment of monthly installment. According to the response of the respondents, COVID-19 has affected more to the service business but with comparison to manufacturing business, service business and agricultural business, trade business are less harm, because they are allowed to open at morning and the evening as per government rules. The main cause of large number of delay repayment of monthly installment is decrease in profit due to decrease in revenue of the business.

#### *Qualitative Analysis*

The finding from the quantitative analysis is different from the other pervious researcher findings that the timely repayment has been decreased, the respondents who pay only interest are categories on delay repayment and the borrower who pay whole installments on time are categories on timely repayment. To support the findings from the quantitative analysis and to further analyze the causes of delay repayment, an

open ended and unstructured question was asked with the microfinance loan borrowers. Due to COVID-19 pandemic both the loan borrowers and lenders are facing the problem in loan repayment. There are various factors that are affected by COVID-19 pandemic, whose impact is clearly seen in repayment of loan.

Client Characteristics: Nature of borrowers' family members leads to the timely repayment of loan. Usually educated families are more understanding and supportive towards the process of loan repayment and in case of loan default, the family members are ready to pay on behalf of the borrowers. Due to COVID-19, loan borrowers are facing both financial and non-financial problem. People are suffering from psychological pressure. They are facing lots of difficulties while fulfilling their daily basic needs. The expenses of the household increase as the increase in number of dependents in the family so in these pandemic day's client are facing difficulty for paying monthly installment on time. This COVID-19 pandemic has affected their business, due to lockdown they source of income has been decreased.

Business characteristics: Borrowers repay the loan from the profit earned by the business they have invested in. While some businesses start to make profit as soon as they are operated while some businesses like farming, animal husbandry, etc. take some time before they start to earn profit. Some businesses also fail to make any profit at all. But in current situation most of the business fail to earn profit due to COVID-19 pandemic which creates higher rate of delay loan repayment. Government has announced lockdown in Nepal for 2 weeks, but it extended for more than 5 months. This pandemic lockdown has affected all types of business and creates poor cash flow in the market. According to the response of the respondents, COVID-19 has affected more to the service business such as vehicles, beauty parlor, food stalls and so on.

One of the respondents whose name is Sarita Bhushal, she is 34 years old, she has borrowed NRs. 2 lakhs from microfinance to help her husband for paying down payment of their vehicle and her husband himself work as driver and provide service for public. But due to COVID-19 pandemic their business is harm, their service business is closed during lockdown period. She said that income from the vehicle was only their source of income now they are facing problem how they are going to their monthly installment of microfinance loan on time.

Likewise, the food stalls and beauty parlor and tailoring business are highly affected by lockdown. According to respondents, the income of these business are decreased by 70-80% and the new business which are entered recently in the market are in the loss that they don't have future may be they will disappear in the upcoming days. Somehow loan borrowers are managing interest to pay which is compulsory according to company policy. Similarly manufacturing business are facing the problem lack of essential raw materials so they are not able to meet the demand. And the client who are engaged in agriculture, due to lockdown farmers are unable to sell their produced product or they are forced to sell their produced product at low price and also many small enterprises are unable to operate their business with uncertainty. This decreases their revenue and business profit which ultimately affect loan repayment. According to government rules vegetable shop, butcher shops and grocery shops are at morning and evening during lockdown period so as per respondent's view they earn some portion, but they have to pay rent, and fulfill the daily needs of their children. Business such as readymade clothes and shoes shops are also affect due to lockdown and grocery shops are allowed to open at morning and evening, so this is only the source of income as per respondents.

Lenders' behavior: When the government announced to pay tax at the end of fiscal year then all financial institutions send notice to repay their monthly installment on time. So, microfinance institutions send their loan borrowers to repay their monthly installment. They make compulsory to pay at least interest of their loan. It creates difficult situation for the loan borrowers to pay 3-4 months interest at once. It is large amount for the borrowers whose businesses have been closed during whole lockdown period and there is no income so that they have to manage money from the other sources.

#### *How loan borrowers manage to repay monthly installment during COVID-19?*

In Nepal, as in many other developing countries, MFIs are at forefront of providing financial services to the low-income population, but due to lockdown farmers are unable to sell their produced product or they are forced to sell their produced product at low price and also many small enterprises are unable to operate their business with uncertainty. It reflects in the delinquency in repayment due to decrease in client's income. Due to lockdown, MFIs are not able to conduct regular center meetings with clients to carry out transaction so there is delay in loan repayments by the loan borrowers.

During COVID-19 pandemic borrowers manage funds to repay their interest and some of them pay full monthly installment. According to respondent, microfinance institutions send notice that they have to pay compulsory interest of their loan if they are unable to pay whole installments. Most of the respondents manage from their own business that government has allowed them to open morning and in the evening so they collect some funds by selling their products and also from family supports. They borrow money from their family members. Some of the respondents are using their past saving to repay interest of their loan because it is compulsory to repay at the end of fiscal years. Some of the respondents manage funds from other source of income such as house rent, husband's pension funds, family business and remittance from the abroad. Due to lockdown borrower are forced to manage funds compulsory for repayment of loan, their family member helps them to repay interest and monthly installment on time. Some of the respondents borrow additional loan from their friends and their relatives and also from their group members. Borrowers who are engaged on agriculture, they sell vegetables from the field to vendors as well as to final consumers so they earn some funds that help to repay them. And some of the respondents pay 3 months installment by borrowing with family member and friends.

COVID-19 is spreading across the globe and health care providers are urging people not to take it for granted. And this pandemic has brought with unexpected levels of stress, anxiety, and fear for business across the globe. It has affected all types of business and organizations along with microfinance institutions. As per the analysis by the Asian Development Bank, this deadly disease will hit almost every sectors of the Nepalese economy. It affects in number of sectors like tourism, trade and production linkages, supply and health. The people who are working on foreign countries are returning Nepal, they lost their job due to this pandemic, so the remittance of the country is decreasing day by day and the unemployment rate is increasing. It affects the small enterprise also, some of the startup small enterprise going to vanish from the market and some of them are suffering loss due to lockdown so many people are losing their job. These problems ultimately affect in the loan repayment, due to decrease in revenue of the business the loan borrowers are unable to repay monthly

installment in time. In this study, the rate of delay repayment is larger than timely repayment because of COVID-19 pandemic.

## Conclusion

Microfinance allows to pursue entrepreneurial projects that generate extra income, thus helping them to better provide for themselves and their families. Microfinance programs use a variety of models which have shown there is strong repayment records, often higher than conventional borrowers. There are various policies that an organization has to ensure that credit administration is done effectively. One of these policies is a collection policy which is needed because all customers do not repay in time and some of the customers are slow payers and some are non-payers. Regulating in collections keeps debts alert and they tend to pay their dues promptly. The current study examines determinant factors influencing loan repayment of MFI clients in the context of COVID-19 of Lalitpur District Nepal. The study concludes that age of the borrower, educational level of borrowers, types of the business and profit generated business influence the repayment of loan and but family size, skills, age of business, work performance, transparent communication and clarity of MFI policy do not have any impact on repayment of loan.

COVID-19 pandemic has affected all types of business and creates poor cash flow in the market. Borrowers are facing both financial and non-financial problems. This pandemic has affected their business, due to lockdown their source of income has been decreased which causes large number of delayed repayment of monthly installment is decreased in profit due to a decrease in revenue of the business. Borrowers are managing their funds by selling fixed assets, borrowing with family members, remittance and other borrowed from group members to pay a monthly installment. So MFIs in Nepal need to improve their work performance and policies and should not involve in unhealthy competitions to decrease the rate of delay repayment of monthly installments and they should design the policies to uplift their borrower economically during this pandemic. Microfinance institutions must adopt flexible policies and should provide digital facility and also lower the interest rate during this pandemic. Finally, MFIs are suggested to support their clients during this pandemic in the process of business resilience.

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## Declaration of conflicting interests

The authors declare no conflict of interest.

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## Author contributions

*Conceptualization:* Shrestha; Thapa. *Methodology:* Shrestha; Thapa. *Software:* Shrestha. *Validation:* Shrestha. *Formal Analysis:* Shrestha. *Investigation:* Shrestha. *Data Curation:* Shrestha. *Writing – Original Draft:* Shrestha. *Writing – Review & Editing:* Shrestha; Thapa. *Visualization:* Thapa. *Supervision:* Thapa.

## Ethical statement

This research did not require an ethical approval as it does not involve any human or animal experiment.

## Data availability statement

Data have been used only for this paper.

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# A confirmation of the expected interval: Ab initio estimation technique of parsimonious Gompertz mortality parameters

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## Abstract

The Gompertz law states a functional relationship on exponential scale between instantaneous intensity and age. The objective is to first estimate the model parameters by using mortality data and then confirm the interval of validity for the estimated parameters. The parsimonious model is implicitly expressed in terms of age and level of mortality while the force of mortality is the dependent variable. Current contributions in actuarial literature have made it tractable to obtain life span from the actuarial point of view, making the life table invaluable analytical tool for insurers. Mortality functions which have been developed recently possess sophisticated actuarial techniques with many parameters hence they are very complex to estimate numerically making it difficult to fit to mortality data. In order to overcome this problem, we need to employ numerical algebraic method to estimate the appropriate values of model parameters and which may enable us fit the function to mortality data. In this paper, the direct algebraic method offers simpler perspective of approximating mortality parameter and was decomposed into systems of algebraic equations. We observed that mortality  $C$  over all ages for males is lower than that of females while the initial mortality  $B$  for male is higher than that of female. The R-language software was employed in the computation. In view of actuarial benchmarks, our results confirm that the values of  $B$  and  $C$  for both males and females lie within the expected interval  $\frac{1}{10^6} < B < \frac{1}{10^3}$  and  $108 \times 10^{-2} < C < 112 \times 10^{-2}$ . Furthermore, by reason of extra risk  $\zeta$ , our results show that

$$\zeta \int_0^n \mu_{x+s} ds = e^{\beta + \zeta x + \zeta n} - e^{\beta + \zeta x}.$$

**Keywords:** Gompertz, intensity, mortality, interval of validity, extra risk

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## Introduction

A life table is an actuarial tool summarizing the mortality experience of a cohort and it produces information on longevity and life expectancy. Despite its use in studying mortality trends, the life table can further be used to summarize any duration function such as duration of marriage, duration of sickness or duration of disability. Mortality table are mainly applied in life contingencies' computations to value life and pensions funds, however the procedures of constructing mortality table is quite involving taking time and resources to finish up. Within the time interval from the commencement to the completion, the set assumptions called the basis functions could have varied. The change could be due to innovations in health care delivery or outbreak of a pandemic like covid-19. The change in question could make the mortality table become irrelevant thus the risk could further render it unusable within that defined period. Mortality table remains potent drivers in life insurance contract product pricing and financial stability for life insurance liabilities. Policy regulators continue to express great concerns the level of deviation arising between the forecasted and the actual mortality because the deviation will result in cash flow distortions that may make life office financially unstable. The unexpected will definitely impact on underwriters' cash payment and reduced insurance business resulting in financial instability. Consequently, profit margins are affected because claims amount out go exceeds premium income collected. In order to compute appropriate premium, life offices need. We observe in Andreeski & Vasant (2008), that various functions were developed to estimate life tables but are really very complex to permit the technique of simple methods such as direct algebraic method, maximum likelihood or methods of moments to estimate the parameters. Following Higgins(2003); Canudas-Romo(2008); Missov, Lenart , Nemeth , Canudas-Romo & Vaupel (2015) and Chukwu & Ogunde (2016) hence some efforts are made to model the functional form which could estimate mortality data in an efficient manner. Various authors such as Strehler & Mildvan (1960) have proposed genetical theories to support the exponential increase in death rates as age increases. All of these theories are deeply rooted in Gompertz function formulated by Gompertz (1825) and modeled as  $\mu(\tau) = Ke^{\delta\tau}$  where  $\mu$  is the mortality intensity,  $\delta$  and  $k$  are constants and  $\tau$  is the age parameter. Other theories employing the Gompertz model is the Strehler & Mildvan theory. The Strehler & Mildvan theory falls in line with Gompertzian mortality kinetics but has a linear decay of physiological function at a rate consistent with observation. The theory can project the numerical inverse relation between Gompertz slopes and intercept which has been observed. The description of the various causes of death across age spectrum which leads to increase in mortality when using Gompertz model has proved helpful as a build-up of the theories outlined above. In view of Bongaarts (2005), Actuaries have adopted as a norm the functional relationships between age and mortality rate so that any deviation from this norm suggests that within any age spectrum, the population being treated has abnormal risk. Over the years, estimations of mortality tables have been constructed in connection with distinct functions other than the functions mentioned earlier. However, one of the most successful model formulated is the Gompertz-Makeham's model. This model results in higher degree of accuracy approximations for mortality data other than the ones explained earlier. The Gompertz-Makeham model is wholly built on the Gompertz mortality function. In Mahdi & Gupta (2012), Cohen, Bohk-Ewald & Rau (2018), this function is usually applied to model human mortality and to compute life tables motivating other estimation methods being suggested for this model with respect to complete and censored mortality data. The choice of approximation technique relies wholly on the area of interest. As observed in Mahdi & Gupta (2012), it is most probable that the technique of approximations is differently appealing to

distinct users. Following Melnikov & Romaniuk (2006) and Tai, Noymer (2017), this new variation of Gompertz' distribution also has aroused much interest in actuarial literature. In Willemse & Koppelaar (2000), the quintile function of Gompertz-Makeham has been associated with a closed form equation by applying the Lambert W function. Mortality at extreme ages seems to deviate from the Gompertz's model, hence the logistic model has been proposed to take care of this departure to fit human mortality. The approximations of mortality rate at extreme ages are hard to compute since only a few lives survive to these ages. Moreover, mortality data at extreme ages are rare and subject to age exaggeration. The deterministic demographic approximations of mortality based on period data, experience well-known denominator problems. In order to calculate better estimates of mortality at extreme ages, mortality data are combined together for different calendar periods. The distribution of mortality by single year shows few numbers of lives surviving to the end of the life table making approximations of mortality at extreme ages inadequate. In Zempleni (2006) and Mahdi & Gupta (2012), the Gompertz's model is applied for modeling human lifetimes in the context of life insurance. In a research conducted to test the adequacy of Taylor's law on Gompertz's, Makeham's and Siler's models, Cohen, Bohk-Ewald & Rau (2018) extended the senescent mortality of Gompertz to 100 years

### Preliminary Survey of Standard Actuarial Functions

According to McNown & Rogers (1992), the mortality rate is a measure of the number of deaths in general due to aging or through a specified cause in a defined population, scaled to the size of that population, per unit of time. Mortality is measured because it is useful to public health authorities. Vital statistics systems which is compulsory in many economies, record certain information contained on every death, such as name, age at deaths, and cause of death, then add the number of deaths periodically to compute mortality rates. Mortality data remain good source of information concerning the health status of surviving communities. It generates a summary of the health risk profile, identifies continuous and non-transient patterns of risk profile in certain communities and shows trend patterns in particular causes of death.

For a live age  $x$ , its future lifetime is  $T_x = X - x$ . For a newborn,  $x = 0$ ,

so that we have  $T_0 = X$  (1)

$$S_x(s) = \Pr[T_0 > x + s | T_0 > x] = \frac{S_0(x+s)}{S_0(x)} = {}_s p_x = 1 - {}_s q_x \quad (2)$$

$$F_x(s) = \Pr[T_0 \leq x + s | T_0 > x] = \frac{S_0(x) - S_0(x+s)}{S_0(x)} = {}_s q_x \quad (3)$$

$$f_x(s) = \frac{dF_x(s)}{ds} = \frac{dS_x(s)}{ds} = \frac{f_0(x+s)}{S_0(x)} \quad (4)$$

$p_x$  refers to the probability that  $(x)$  survives for another year.

$q_x = 1 - p_x$ , on the other hand, refers to the probability that  $(x)$  dies within one year.

Following Bowers *et al.* (1997); Hudec (2017); Ogungbenle & Ogungbenle (2020); Ogungbenle

$$\& Adeyele(2020) \mu_x(s) = \frac{f_x(s)}{S_x(s)} = \frac{f_0(x+s)}{S_0(x)} \cdot \frac{S_0(x)}{S_0(x+s)} = \frac{f_0(x+s)}{S_0(x+s)} = \mu_{x+s} \quad (5)$$

$$f_x(s) = {}_s p_x \times \mu_{x+s} = \prod_{t=0}^{s-1} (1 - q_{x+t}) \times \mu_{x+s} \text{ for } s \text{ integral} \quad (6)$$

The probability that  $(x)$  will survive for  $s$  years and die within the next  $u$  years is denoted by  ${}_{s|v} q_x$ .

This is equivalent to the probability that  $(x)$  will die between the ages of  $x+s$  and  $x+s+v$

This can be computed in several ways:

$${}_{s|v} q_x = \Pr[t > T_x \leq s+v] \quad (7)$$

$$= \Pr[T_x \leq s+v] - \Pr[T_x < s] \quad (8)$$

$$= {}_{s+v} q_x - {}_s q_x \quad (9)$$

$$= {}_s p_x - {}_{s+v} p_x \quad (10)$$

$$= {}_s p_x \times {}_v q_{x+s} = {}_v q_{x+s} \prod_{t=0}^{s-1} (1 - q_{x+t}) \quad (11)$$

$$\text{We see that } F_x(s) = \int_0^s f_x(\tau) d\tau \quad (12)$$

$$\text{In actuarial notation, } {}_s q_x = \int_0^s {}_\tau p_x \mu_{x+\tau} d\tau \quad (13)$$

$$\text{We can generalize this to } {}_{t|v} q_x = \int_t^{t+v} {}_\tau p_x \mu_{x+\tau} d\tau \quad (14)$$

**Curtate future lifetime** of  $(x)$  is the number of future years completed by a life aged  $(x)$  prior to death.

$K_x = [T_x]$ , the greatest integer part of  $T_x$

Its probability mass function is

$$\Pr[K_x = k] = \Pr[k \leq T_x < k+1] = \Pr[k < T_x \leq k+1] \quad (15)$$

$$= S_x(k) - S_x(k+1) = {}_{k+1} q_x - {}_k q_x = {}_{k|} q_x, \quad (16)$$

for  $k = 0, 1, 2, 3, \dots$

$$\text{Its distribution function is } \Pr[K_x \leq k] = \sum_{h=0}^k {}_{h|} q_x = {}_{k+1} q_x \quad (17)$$

The expected value of  $T_x$  is called the complete expectation of life:

$$e_x = E[T_x] = \int_0^\infty s f_x(s) ds = \int_0^\infty s {}_s p_x \mu_{x+s} ds \quad (18)$$

$$e_x = \int_0^\infty -s \frac{\partial {}_s p_x}{\partial x} ds = - \left[ s \frac{\partial {}_s p_x}{\partial x} \right]_0^\infty + \int_0^\infty {}_s p_x ds \quad (19)$$

$$e_x = \int_0^\infty {}_s p_x ds \quad (20)$$

The expected value of  $K_x$  is called the curtate expectation of life:

$$e_x = \sum_{k=1}^\infty k p_x = (p_x) E[K_x / T_x \geq (p_x + q_x)] + \quad (21)$$

$$(p_x) E[K_x / T_x < (p_x + q_x)] = (1 - q_x)(1 + e_{x+1})$$

Let  $\rho$  and  $\lambda$  be real constants and assume that the survival function of a newborn is exponentially defined as  $\lambda S_X(s) = -\rho(e^{\lambda s} - 1)$  and cumulative hazard function be

$$Z(s) = \log_e \left[ \frac{1}{S_X(s)} \right] = \log_e [S_X(s)]^{-1} = -\log_e [S_X(s)] \quad (22)$$

$$\text{Let } \theta \text{ be the hazard function intensity, then } \theta(s) = \frac{dZ(s)}{ds} = -\frac{\frac{dS_X(s)}{ds}}{S_X(s)} \quad (23)$$

$$Z(s) = \rho \frac{e^{\lambda s} - 1}{\lambda}, \theta(s) = \rho e^{\lambda s} \quad (24)$$

From equation (22),  $S_X(s) = e^{-Z(s)} \Rightarrow F_X(s) = 1 - e^{-Z(s)}$

$$\frac{dF_X(s)}{ds} = f_X(s) = \frac{d(1 - e^{-Z(s)})}{ds} = Z'(s)e^{-Z(s)} = \theta(s)e^{-Z(s)} \quad (25)$$

$$\frac{dF(s)}{ds} = \rho e^{\lambda s} e^{-\left(\rho \frac{e^{\lambda s} - 1}{\lambda}\right)} = \rho e^{\lambda s - \left(\rho \frac{e^{\lambda s} - 1}{\lambda}\right)} \quad (26)$$

$$\frac{d^2 F(s)}{ds^2} = \frac{df(s)}{ds} = \theta'(s)e^{-Z(s)} - \theta(s)e^{-Z(s)}Z'(s) \quad (27)$$

$$\frac{d^2 F(s)}{ds^2} = \theta'(s)e^{-Z(s)} - [\theta(s)]^2 e^{-Z(s)} = \quad (28)$$

$$\left\{ \theta'(s) - [\theta(s)]^2 \right\} e^{-Z(s)} \quad (29)$$

$$\frac{d^2 F(s)}{ds^2} = \left\{ \rho \lambda e^{\lambda s} - [\rho e^{\lambda s}]^2 \right\} e^{-Z(s)} = \left\{ \rho \lambda e^{\lambda s} - \rho^2 e^{2\lambda s} \right\} e^{-Z(s)} \quad (29)$$

$$\frac{d^3 F(s)}{ds^3} = \left\{ \rho \lambda^2 e^{\lambda s} - 2\lambda \rho^2 e^{2\lambda s} \right\} e^{-Z(s)} - Z'(s) \left\{ \rho \lambda e^{\lambda s} - \rho^2 e^{2\lambda s} \right\} e^{-Z(s)} \quad (29a)$$

$$\frac{d^3 F(s)}{ds^3} = e^{-Z(s)} \left[ \left\{ \rho \lambda^2 e^{\lambda s} - 2\lambda \rho^2 e^{2\lambda s} \right\} - \theta(s) \left\{ \rho \lambda e^{\lambda s} - \rho^2 e^{2\lambda s} \right\} \right] \quad (29b)$$

$$\frac{d^3 F(s)}{ds^3} = e^{-Z(s)} \left[ \rho \lambda^2 e^{\lambda s} - 2\lambda \rho^2 e^{2\lambda s} - \rho^2 \lambda e^{2\lambda s} + \rho^3 e^{3\lambda s} \right] = \quad (29c)$$

$$e^{-Z(s)} \left[ \rho \lambda^2 e^{\lambda s} - 3\lambda \rho^2 e^{2\lambda s} + \rho^3 e^{3\lambda s} \right]$$

From equation (29), If  $\left\{ \rho \lambda e^{\lambda s} - \rho^2 e^{2\lambda s} \right\} e^{-Z(s)} = 0$ ,  $\rho \lambda e^{\lambda s} - \rho^2 e^{2\lambda s} = 0 \Rightarrow \rho \lambda e^{\lambda s} = \rho^2 e^{2\lambda s}$  (30)

Let  $\zeta = \rho e^{\lambda s} \Rightarrow \lambda \zeta - \zeta^2 = 0 \Rightarrow \zeta(\zeta - \lambda) = 0 \Rightarrow \zeta = \lambda, \zeta = 0$  (31)

Thus there are two points of inflexion

$$\rho e^{\lambda s} = 0 \Rightarrow \rho = 0 \quad (32)$$

$$\rho e^{\lambda s} = \lambda \Rightarrow \rho + \rho \lambda s = \lambda \Rightarrow s = \frac{1}{\rho \lambda} (\lambda - \rho) \quad (33)$$

From equation (33),  $\rho$  cannot be zero

## 2.1 Procedures For Obtaining Estimated Probability Of Survival

$$\text{We define, } l_{x+s} = l_x + s\Delta l_x + \frac{s(s-1)}{2!} \Delta^2 l_{x-1} \quad (34)$$

where  $\Delta l_x = l_{x+1} - l_x$  is the forward differencing

$$\mu_x = \frac{-1}{l_x} \left( \frac{dl_{x+s}}{ds} \right)_{s=0} = \frac{-1}{l_x} (\Delta l_x - 0.5\Delta(\Delta l_{x-1})) = 0.5 \frac{l_{x-1}}{l_x} - 0.5({}_1P_x) \quad (35)$$

Using a Gauss forward formula to order 4, and following Ogungbenle & Adeyele (2020), we

$$\text{have } l_{x+s} = l_x + s\Delta l_x + \frac{(s^2-s)}{2} \Delta^2 l_{x-1} + \frac{(s^3-s)}{6} \Delta^3 l_{x-1} + \frac{(s^3-s)(s-2)}{24} \Delta^4 l_{x-2} \quad (36)$$

$$\mu_x = \frac{-1}{l_x} \left( \frac{dl_{x+s}}{ds} \right)_{s=0} = \frac{-1}{l_x} \left( \Delta l_x - 0.5\Delta(\Delta l_{x-1}) - \frac{1}{6} \Delta(\Delta^2 l_{x-1}) + \frac{1}{12} \Delta(\Delta^3 l_{x-2}) \right) \quad (37)$$

hence

$$12l_x \mu_x = 8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2}) \quad (38)$$

$$\text{Now, } dl_x = -l_x \mu_x dx \quad (38a)$$

$$[l_{x+t}]_0^m = - \int_0^m (\mu_{x+t}) l_{x+t} dt \quad (38b)$$

$$l_{x+m} - l_x = - \int_0^m (\mu_{x+t}) l_{x+t} dt \quad (38c)$$

$$l_x - l_{x+m} = \int_0^m (\mu_{x+t}) l_{x+t} dt \Rightarrow {}_m d_x = \int_0^m (\mu_{x+t}) l_{x+t} dt \quad (38d)$$

$$\text{Using equation (38), } {}_m q_x = \int_0^m \left( \frac{8(l_{x+s-1} - l_{x+s+1}) - (l_{x+s-2} - l_{x+s+2})}{12l_{x+s}} \right) ({}_t P_{x+s}) ds \quad (38e)$$

$${}_m q_x = \int_0^m \left( \frac{8(l_{x+s-1} - l_{x+s+1}) - (l_{x+s-2} - l_{x+s+2})}{12} \right) l_{x+s+t} ds \quad (38f)$$



$$q_0 = \int_0^1 \left( \frac{8(l_{s-1} - l_{s+1}) - (l_{s-2} - l_{s+2})}{12} \right) l_{s+t} ds \quad (38g)$$

thus  $q_0$  is independent of age  $x$  at time  $s$

$$\text{From equation (38d), } q_x = \int_0^1 (\mu_{x+t})_t P_x dt \Rightarrow l_x q_x = \int_0^1 (\mu_{x+t}) l_{x+t} dt$$

$$\frac{d}{dt} (\mu_{x+t}) l_{x+t} \geq 0 \Rightarrow$$

$$\left( \frac{d}{dt} \mu_{x+t} \right) l_{x+t} + (\mu_{x+t}) \frac{d}{dt} l_{x+t} = (\mu_{x+t}^2) l_{x+t} - (\mu_{x+t}^2) l_{x+t} = 0$$

hence  $(\mu_{x+t}) l_{x+t}$  is non-decreasing, and  $(\mu_{x+t}) l_{x+t} \geq 0$

then within the interval  $0 \leq t \leq 1$ ,  $l_x \mu_x < l_x q_x \Rightarrow \mu_x < q_x$  in the life table

**Theorem:** If  ${}_t q_x$  is a continuous function, then it is possible to obtain the minimum where

$${}_t P_x = \frac{[8(l_{x+t-1} - l_{x+t+1}) - (l_{x+t-2} - l_{x+t+2})]}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \text{ and } \mu_{x+1} = \mu_x \quad (38f)$$

**Proof**

$$\text{Note that by definition, } \mu_x = \lim_{\Delta t \rightarrow 0^+} \frac{\Delta({}_t q_x)}{\Delta t} = \lim_{\Delta t \rightarrow 0^+} \frac{\Pr(T(x) < \Delta t)}{\Delta t}$$

$$\frac{d}{dx} (1 - {}_t P_x) = {}_t P_x (\mu_{x+t} - \mu_x) = \frac{d}{dx} ({}_t q_x) \quad (38h)$$

$${}_t P_x (\mu_{x+t} - \mu_x) = 0 \Rightarrow (\mu_{x+t} - \mu_x) = 0, \quad {}_t P_x \neq 0 \quad (38i)$$

$$\mu_{x+t} = \mu_x, \quad (38j)$$

$$\frac{1}{12l_{x+t}} [8(l_{x+t-1} - l_{x+t+1}) - (l_{x+t-2} - l_{x+t+2})] = \frac{1}{12l_x} [8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})] \quad (38k)$$

$$[8(l_{x+t-1} - l_{x+t+1}) - (l_{x+t-2} - l_{x+t+2})] = \frac{l_{x+t}}{l_x} [8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})] \quad (38l)$$

$$[8(l_{x+t-1} - l_{x+t+1}) - (l_{x+t-2} - l_{x+t+2})] = {}_t P_x [8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})] \quad (38m)$$

$${}_t P_x = \frac{[8(l_{x+t-1} - l_{x+t+1}) - (l_{x+t-2} - l_{x+t+2})]}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \quad (38n)$$

since  $t = 0$  is not possible, consequently

so at  $t = 1$

$${}_1P_x = \frac{[8(l_x - l_{x+2}) - (l_{x-1} - l_{x+3})]}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \text{ and} \quad (38p)$$

$\mu_{x+1} = \mu_x$  hence,  ${}_1q_x$  attains its minimum

If  ${}_tP_x$  were continuous in the interval  $0 \leq t \leq 1$ , then  $l_{x+t} = (1-t)l_x + tl_{x+1}$  for integral  $x$ , then (38n) becomes

$${}_tP_x = \frac{\{[8(2-t)l_x + (t-1)l_{x+1} + tl_x + (t+1)l_{x+1}] - [(3-t)l_x + (t-2)l_{x+1} - (-1-t)l_x + (t+2)l_{x+1}]\}}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \quad (39q)$$

$${}_tP_x = \frac{\{(16-8t)l_x + (t-1)l_{x+1} + tl_x + (t+1)l_{x+1} - (3-t)l_x - (t-2)l_{x+1} - (1+t)l_x - (t+2)l_{x+1}\}}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \quad (39r)$$

$${}_tP_x = \frac{\{l_x \langle 16-8t+t-3+t-1-t \rangle + l_{x+1} \langle t-1+t+1-t+2-t-2 \rangle\}}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \quad (39s)$$

$${}_tP_x = \frac{\{\langle 8-7t \rangle l_x\}}{[8(l_{x-1} - l_{x+1}) - (l_{x-2} - l_{x+2})]} \quad (39t)$$

$$\text{At } t = \frac{1}{2}, \quad {}_{\frac{1}{2}}P_x = \frac{l_x}{16(l_{x-1} - l_{x+1}) - 2(l_{x-2} - l_{x+2})} \quad (39u)$$

## Material and Methods

### Gompertz Model

Bowers *et al.* (1997) define the force of mortality as Gompertz apply the exponential function for the instantaneous mortality intensity. For life offices, the model has implications for the parameters and also has minimum number of parameters for obtaining mortality trend over time period. This parsimony accounts for the reason why Gompertz law is justified in mortality. It is observed in literature that within a known collection of mortality models, modest descriptions with respect to their number of parameters are much more preferred to the sophisticated mortality models. Parsimony hence refers to the cardinality of efficient model parameters. Consequently, the Gompertz model offers a good trade-off between a simple numerical computational implementation and efficient analytic process. Gompertz is intuitive and hence reduces the risk of an incongruous implementation. The mortality intensity is defined as follows

In Gompertz (1825),  $\mu_x = BC^x = e^{\beta+\zeta x}$ ,  $x > 0$  and subject to: (39)

$$\begin{cases} C > 1 \\ B \neq 1 \end{cases} \quad (39a)$$

The constant  $B$  is the level of the mortality intensity of a newborn while the constant  $C$  describes the rate of demographic ageing. Thus, the death probability increases at a constant exponential rate when age increases in the equation implying exponential ageing. In the logarithmic scale  $\ln \mu_x = \beta + \zeta x$  translating to the fact that logarithmic function of Gompertz's law is linearly increasing  $B$  is the starting point of parameter and  $C$  is the rate of mortality over ages while  $x$  is the initial age of analysis

$$\int_0^x \mu_s ds = \int_0^x BC^s ds \quad (40)$$

$$\int_0^x \mu_s ds = \left[ \frac{Bc^s}{\log_e C} \right]_0^x \Rightarrow \frac{Bc^x}{\log_e C} - \frac{B}{\log_e C} \quad (41)$$

$$\int_0^x \mu_s ds = -(C^x - 1) \log_e g, \text{ where, } \log_e g = \frac{-B}{\log_e C} \quad (42)$$

$$\int_0^x \mu_s ds = -\log_e g^{C^x-1} \quad (43)$$

$$l_x = l_0 e^{-\int_0^x \mu_s ds} = l_0 e^{\log_e g^{C^x-1}} = l_0 g^{C^x-1} \quad (44)$$

$$l_x = \frac{l_0}{g} g^{C^x} = kg^{C^x}, k = \frac{l_0}{g} \quad (45)$$

$${}_s p_x = \frac{kg^{C^{x+1}}}{kg^{C^x}} = {}_s p_x = g^{C^x(C'-1)} \quad (46)$$

Again, as  $\lim_{x \rightarrow \omega} {}_t P_x \rightarrow 0$

$$\int_0^\omega {}_t f_T(t) dx = \int_0^\omega {}_t \mu(x+t) {}_t P_x dx \quad (47)$$

$$\int_0^\omega {}_t f_T(t) dt = \int_0^\omega t \frac{\partial({}_t P_x)}{\partial t} dt = {}_t P_x \Big|_{t=0}^{t=\omega} - \int_0^\omega \frac{\partial({}_t P_x)}{\partial t} dt \quad (48)$$

$$\int_0^\omega {}_t f_T(t) dt = - \int_0^\omega \frac{\partial({}_t P_x)}{\partial t} dt = \int_0^\omega {}_t P_x dt \quad (49)$$

$$\int_0^\omega {}_t f_T(t) dt = - \int_0^\omega \frac{\partial({}_t P_x)}{\partial t} dt = \int_0^\omega g^{C^x(C'-1)} dt \quad (50)$$

#### Data Presentation and Analysis

Life offices usually would like to consider the level at which a live commences a career in order to permit them to assess the salary structure of an insured ( $x$ ) and to make it more rewarding when ( $x$ ) are dealing with the life office. Life offices usually make assumption to set the age where mortality data is fitted by a model. Again, many lives who start a career obtain university

education or equivalents and thereafter assume an office around 20 years. Consequently, as we consider the career of individuals, it seems appropriate to collect data from age 20 .

Using the formulae that are developed above, we construct the following results for male and female using R-language. For the purpose of this study, the data used in this study came mainly from the mortality of the population of England and Wales during the years 1990, 1991 and 1992.

### For Males

$$98496 = kg^{c^{20}} \quad (51)$$

$$96500 = kg^{c^{40}} \quad (52)$$

$$86714 = kg^{c^{60}} \quad (53)$$

Divide equation (52) by (51) and equation (53) by (51)

$$\frac{96500}{98496} = \frac{kg^{c^{40}}}{kg^{c^{20}}} \quad (54)$$

$$0.9797352177 = g^{c^{20}(c^{20}-1)} \quad (55)$$

$$\frac{86714}{96500} = \frac{kg^{c^{60}}}{kg^{c^{40}}} \quad (56)$$

$$0.8985906736 = g^{c^{40}(c^{20}-1)} \quad (57)$$

From equation (55)

$$\log_e 0.9797352177 = c^{20}(c^{20}-1)\log_e g \quad (58)$$

From equation (57)

$$\log_e 0.8985906736 = c^{40}(c^{20}-1)\log_e g \quad (59)$$

Divide (59) by (58)

$$\frac{\log_e 0.8985906736}{\log_e 0.9797352177} = \frac{c^{40}(c^{20}-1)\log_e g}{c^{20}(c^{20}-1)\log_e g} \quad (60)$$

$$5.222880263 = c^{20} \quad (61)$$

$$c = 1.086164248 \quad (62)$$

From equation (53) and (52)

$$\frac{86714}{96500} = \frac{kg^{(1.086164248)^{60}}}{kg^{(1.086164248)^{40}}} \quad (63)$$

$$0.8985906736 = 115.1937482g \quad (64)$$

$$\log_e 0.8985906736 = 115.1937482 \log_e g \quad (65)$$

$$\frac{\log_e 0.8985906736}{115.1937482} = \log_e g \quad (66)$$

$$-4.031303257 \times 10^{-4} = \log_e g \quad (67)$$

$$g = e^{-0.0004031303257} \quad (68)$$

$$g = 0.9995969509 \quad (69)$$

From equation (53)

$$86714 = kg^{c^{60}} \quad (70)$$

$$86714 = k(0.9995969509)^{142.4722266} \quad (71)$$

$$86714 = 0.9441833755k \quad (72)$$

$$k = 91840.21055 \quad (73)$$

$$\log_e g = \frac{-B}{\log_e C} \quad (74)$$

$$-B = \log_e g \times \log_e C \quad (75)$$

$$-B = \log_e 0.9995969509 \times \log_e 1.086164248 \quad (76)$$

$$-B = -6.284487294 \times 10^{-6} \quad (77)$$

$$B = 0.000006284487294 \quad (78)$$

$$\mu_x = Bc^x \quad (79)$$

$$\mu_x = 0.000006284487297(1.086164248)^x \quad (80)$$

$$l_x = (91840.210546049)0.9995969509^{(1.086164248)^x} \quad (81)$$

$$d_x = (91840.210546049)0.9995969509^{(1.086164248)^x} - (91840.210546049)0.9995969509^{(1.086164248)^{x+1}} \quad (82)$$

**For Females**

$$98957 = kg^{c^{20}} \quad (83)$$

$$97952 = kg^{c^{40}} \quad (84)$$

$$91732 = kg^{c^{60}} \quad (85)$$

Divide equation (84) by (83) and (85) by (84)

$$\frac{97952}{98957} = \frac{kg^{c^{40}}}{kg^{c^{20}}} \quad (86)$$

$$0.9898440737 = g^{c^{20}(c^{20}-1)} \quad (87)$$

$$\frac{91732}{97952} = \frac{kg^{c^{60}}}{kg^{c^{40}}} \quad (88)$$

$$0.93649951 = g^{c^{40}(c^{20}-1)} \quad (89)$$

From equation (87)

$$\log_e 0.9898440737 = c^{20}(c^{20}-1)\log_e g \quad (90)$$

From equation (89)

$$\log_e 0.93649951 = c^{40}(c^{20}-1)\log_e g \quad (91)$$

Divide (91) by (92)

$$\frac{\log_e 0.93649951}{\log_e 0.9898440737} = \frac{c^{40}(c^{20}-1)\log_e g}{c^{20}(c^{20}-1)\log_e g} \quad (92)$$

$$6.427042235 = c^{20} \quad (93)$$

$$c = 1.097489964 \quad (94)$$

From equation (85) and (84)

$$\frac{91732}{97952} = \frac{kg^{(1.097489964)^{60}}}{kg^{(1.097489964)^{40}}} \quad (95)$$

$$0.93649951 = 224.1741328g \quad (96)$$

$$\log_e 0.93649951 = 224.1741328\log_e g \quad (97)$$

$$\frac{\log_e 0.93649951}{224.1741328} = \log_e g \quad (98)$$

$$-1.27099613 \times 10^{-4} = \log_e g \quad (99)$$

$$g = e^{-0.000127099613} \quad (100)$$

$$g = 0.9998729085 \quad (101)$$

From equation (85)

$$91732 = kg^{c^{60}} \quad (102)$$

$$91732 = k(0.9998729085)^{265.4810041} \quad (103)$$

$$91732 = 0.9668204064k \quad (104)$$

$$k = 94880.08259 \quad (105)$$

$$\log_e g = \frac{-B}{\log_e c} \quad (106)$$

$$-B = \log_e g \times \log_e c \quad (107)$$

$$-B = \log_e 0.9998729085 \times \log_e 1.097489964 \quad (108)$$

$$-B = -0.00005519864486 \times 0.04040055753 \quad (109)$$

$$-B = -2.230056027 \times 10^{-6} \quad (110)$$

$$B = 0.000002230056027 \quad (111)$$

$$\mu_x = Bc^x \quad (112)$$

$$\mu_x = 0.000002230056027 (1.097489964)^x \quad (113)$$

$$l_x = (94880.08259) 0.9998729085^{(1.097489964)^x} \quad (114)$$

$$d_x = (94880.08259) 0.9998729085^{(1.097489964)^x} \quad (115)$$

$$-(94880.08259) 0.9998729085^{(1.097489964)^{x+1}}$$

### Discussion of Result

The constructed empirical curves are the approximates of the corresponding theoretical functions. From our results, we observed that mortality over all ages (C-value) for males is lower than that of females while the initial mortality (B-value) for male is higher than that of female. Subject to the inequalities in (39a) and comparing with standard results in Bowers *et al.* (1997), our results strictly satisfy the constraints that the rate of demographic ageing  $C > 1$  and initial mortality  $B > 0$ . Furthermore, based on our results the values of  $B$  and  $C$  for both males and

females lie within the expected interval  $\frac{1}{10^6} < B < \frac{1}{10^3}$  and  $108 \times 10^{-2} < C < 112 \times 10^{-2}$ . (116)

From equations (80) and (81) above, the male probability density function is given by

$$f_{T(x)}(t) = 0.000006284487297(1.086164248)^{x+t} \times \frac{(91840.210546049)0.9995969509^{(1.086164248)^{x+t}}}{(91840.210546049)0.9995969509^{(1.086164248)^x}} \quad (117)$$

$$f_{T(x)}(t) = 0.000006284487297(1.086164248)^{x+t} \times \frac{0.9995969509^{(1.086164248)^{x+t}}}{0.9995969509^{(1.086164248)^x}} \quad (118)$$

while from equations (112) and (113) the female density is

$$f_{T(x)}(t) = 0.000002230056027(1.097489964)^{x+t} \times \frac{(94880.08259)0.9998729085^{(1.097489964)^{x+t}}}{(94880.08259)0.9998729085^{(1.097489964)^x}} \quad (119)$$

$$f_{T(x)}(t) = 0.000002230056027(1.097489964)^{x+t} \times \frac{0.9998729085^{(1.097489964)^{x+t}}}{0.9998729085^{(1.097489964)^x}} \quad (120)$$

$\mu_0^{FEMALE} = 0.000002230056027$  for female and the estimates of  $\mu_0^{MALE} = 0.000006284487297$  for male although mortality changes at initial stages of life within age interval  $0 \leq x < 1$  and as a result of the variation in this interval, obtaining values for  $\mu_0$  is usually not unique. Furthermore, it is also possible that the force of mortality at very old age is greater than 1 due to the fact that force of mortality is not a probability and consequently one expects that its value may exceed 1 towards the end of the mortality table.

However, given an extra risk  $\xi$  involving a constant sum to the mortality intensity

$$\text{then } \mu_x^E = \mu_x + \xi = e^{\beta + \zeta x} + \xi \quad (121)$$

$$\text{The force of interest } \delta = \log_e(1+i) \quad (122)$$

$$\log_e({}_n P_x) = -\int_0^n \mu_{x+s} ds. \quad (123)$$

Therefore,

$$\log_e({}_n P_x^E) = -\int_0^n (\mu_{x+s} + \xi) ds = -\int_0^n \mu_{x+s} ds - \int_0^n \xi ds \quad (124)$$

$$\log_e({}_n P_x^E) = -\int_0^n \mu_{x+s} ds - n\xi = \log_e({}_n P_x) - n\xi \quad (125)$$

$$\log_e({}_n P_x^E) - \log_e({}_n P_x) = -n\xi \quad (126)$$



$$\log_e \frac{{}_n P_x^E}{{}_n P_x} = -n\xi \quad (127)$$

$$\frac{{}_n P_x^E}{{}_n P_x} e^{-\delta n} = e^{-n(\xi+\delta)} \Rightarrow ({}_n P_x^E) e^{-\delta n} = ({}_n P_x) e^{-n(\xi+\delta)} = ({}_n P_x) (v^E)^n \quad (128)$$

$$({}_n P_x) e^{-n(\xi+\delta)} = ({}_n P_x) e^{-n\delta^E} \Rightarrow e^{-n\delta^E} = e^{-n(\xi+\delta)} \quad (129)$$

By definition,  $\delta : J \rightarrow R$  is a continuous function on an interval  $J \subset R^+$ . If  $\exists$  a piecewise differentiable continuous function  $A : J \rightarrow R$  such that  $\frac{dA}{ds} = \delta(s)A(s)$ , then

$$A(s) = e^{\int_c^s \delta(\zeta) d\zeta} A(c) \text{ and since } v^E = e^{-\delta^E}$$

we have  $\delta^E = \xi + \delta$ , hence the force of interest has been increased correspondingly. Putting

$$(121) \text{ in } (124), \text{ we have, } \log_e ({}_n P_x^E) = -\int_0^n (e^{\beta+\zeta x+\zeta s}) ds - \int_0^n \xi ds \quad (130)$$

$$\log_e ({}_n P_x^E) = \left[ \frac{e^{\beta+\zeta x+\zeta s}}{\zeta} \right]_0^n - n\xi = \frac{e^{\beta+\zeta x}}{\zeta} - \frac{e^{\beta+\zeta x+\zeta n}}{\zeta} - n\xi \quad (131)$$

$$\text{and by (125), } \log_e ({}_n P_x) = \frac{e^{\beta+\zeta x}}{\zeta} - \frac{e^{\beta+\zeta x+\zeta n}}{\zeta} \quad (132).$$

$$\text{Hence using (123), } \zeta \int_0^n \mu_{x+s} ds = e^{\beta+\zeta x+\zeta n} - e^{\beta+\zeta x} \quad (133)$$

## Conclusion

The paper is motivated to study the actuarial properties of the Gompertz force of mortality and to provide explicit actuarial expressions to estimate model unknown parameters. Although our intention is to confirm the interval of validity within which the parameters fall, survival probabilities was also estimated at off grid points and the effect of an additional given extra risk  $\xi$  involving a constant sum to the mortality intensity was also investigated to capture the relationship between the extra risk and the interest rate intensity.

This study would assist life offices in evaluating actuarial risks connected with death probabilities as we applied simple numerical algebraic procedure to compute the approximate values of the model parameters so as to fit the model to interval of validity. Life offices will understand how to apply an efficient method of analyzing mortality data from a defined population of insured thereby giving an inference into the Gompertz distribution. It is therefore necessary for life offices to allow for upward trend in life expectancy and decrease in mortality rates. The underlying principle of life insurance necessitates that premium advised to the insured should fall in line with his risk profile. An insured's age structure seems to be the most influential factor in appraising risk profile and hence our construction can be used to compute mortality table and hence life annuity & life assurance products. Furthermore, sex is another important factor since it has been observed from

our results that male have higher level of mortality rate than female. Because of genetical and behavioral differences, life offices should advise measurable premiums to male and female depending on sex. Life offices may be motivated to assess policyholder's risk profile accurately so as to permit competitive premiums as a result of market pressures. This is usually done by recognizing risk rating determinants which are cost effective in risk assessment process through actuarial techniques relevant to death probabilities calculations. It is clear that, the accuracy of the age-specific mortality rates is influenced by the accuracy of the age distribution of population and deaths.

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## Socio-economic status of the recipients of social security allowance: a case study of Kaski, Nepal

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### Abstract

The research aims to assess the impact of social security allowance on socio-economic status of the recipients and differences in socio-economic status of the recipients. Multistage sampling technique has been used for the selection of samples. The data has been collected through self-structured questionnaires from 170 respondents who have been receiving social security allowance provided by the Government of Nepal. Thus, descriptive as well as cross-sectional research design has been used for this study. The study found that social security benefits play very important role in improving socio-economic status of the beneficiaries by enhancing the economic well-being, health access, social status, self-respect and respect from others, and living standard of the recipients. The study also found that there is a significant difference in socio-economic well-being of recipients by area of residence, employment status, duration of getting allowance, and allowance as major source of income.

**Keywords:** Social security allowance, Old age allowance, Socio-economic status, Nepal.

### Introduction

Social security benefit is the benefits provided by the government as a means of assisting low-income members of the society such as the unemployed, elderly, sick, retired, disabled, single-parent families, etc. The social security system assures the right of socially, economically, physically, and psychologically vulnerable people for a normal and dignified life. Social security allowances are non-contributory programs that target the poor and vulnerable section of the population and are designed to reduce poverty and inequality, enable better human capital investments, improve social risk management, and offer social protection to people (Khan, 2012). The social security benefit plays a vital role to motivate the people as it provides some protection against old age, disable, vulnerable groups of society, single women, etc. A social security system has been widely

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established as a major policy instrument for enabling people to have basic living standards and arranging financial support against unforeseen risks.

Social security is being considered as a right of the citizen. It is a very important issue of every country. In Nepal, social welfare activities related to helpless women, children, senior citizens, and the disabled have been introduced in Eighth Plan (1992-1997) only. Before this, no due attention was given to the social security policy. At first, a universal flat pension of Rs. 100 to all the elderly people above 75 years was first announced in Nepal in 1994. Later on, the government has introduced allowances to single women, endangered races, people with full disability, and partial disability (National Planning Commission, 2012).

Social Security Allowance reinforces dignity, economic opportunities, respect, and social security for beneficiaries but there is little understanding of the impact and access of the social security allowance on people. Is it valued by them? Does it change the status of people? Does it have any social impact? Does the pension have an equal economic impact on all kinds of people? Who benefits the most from the pension? To answer these questions, an attempt has been made through this study. Hence, the present study aims at assessing the impact of social security allowances on the socio-economic status of people and factors affecting the socio-economic well-being of recipients in the Kaski District of Nepal.

## **Review of Literature**

Various studies related to the socio-economic impact of allowance and the factors affecting socio-economic impact have been conducted. Unnikrishnan and Imai (2020) conducted a study to examine the impact of old age pensions on household welfare in India found that pension helps to increase the welfare of households as it helps to increase the consumption expenditure, food, and non-food expenditure of the recipients while reducing the labor supply. Old age allowance helps to get better care and attention from family members, more health access, and more voice in the decision-making process. It also helps to be financially independent and enhances self-respect and respect from others (Hasan, 2012). A study conducted to examine the impact of the old age allowance (OAA) program on Bangladesh found that OAA helps aged persons to get better positions and respect in society and from family members. The programs have a positive impact on old-aged people but the economic impact is less than the social impact as the amount of allowance is small (Choudhary, 2013). Old age pension enhances the economic as well as mental well-being of old people by reducing sadness and produces the feeling of safety and welfare (Salinas-Rodríguez et al., 2014). Old age pension helps to reduce the working hours of the elderly on the farm and increase the time for grandchild care. It also increases financial independence, bargaining power, and welfare in old age (Li et al., 2018). Old-age pension increases access to formal health care services (Riumallo-Herl & Aguila, 2019).

Dhungana et al. (2020) examined the satisfaction level and use of old age allowance in Nepal. The study found that the majority of the elderly are satisfied with the allowance as it helps to enhance the family relationship and allowance is mostly used for their personal expenditure, and then for health and medicine. Another study by Malakar and Chalise (2019) found

that allowance is a major source of income for most of the elderly in Nepal but the amount is very less, it is not provided on time and there is a long queue in the office for getting allowance. A study conducted by Dhungana and Ranabhat (2018) found that education, marital status, and location are the major factors associated with the socio-economic status of the beneficiaries of old age allowance. Similarly, Mugomeri et al. (2017) shows that the old-age pension was the major source of income for the elderly people and the quality of life of elderly receiving old-age pension is affected by marital status, education level, sources of income, level of satisfaction with income, and type of house .

## Methodology

This study employed a quantitative approach. The study is descriptive and cross-sectional in nature. The study mainly relies on primary data to meet the study objectives. Secondary data was also used to find out the distribution of social security allowance. The secondary sources of data include publications of the Central Bureau of Statistics (CBS) and the Ministry of Federal Affairs and Local Development (MOFALD). The study has been confined to the Kaski District of Nepal which is selected purposively as it is one of the major cities and capital city of Gandaki province of Nepal.

A multi-stage sampling technique was used to select the sample. At first, Rupa Rural Municipality and Pokhara Metropolitan city are selected purposively. Then two wards (6 & 8) from Rupa Rural Municipality and two wards (26 & 32) from Pokhara Metropolitan city were selected randomly. At the final stage, the researchers have selected 170 respondents (85 from each Municipality) as the sample size purposively at 7.5% margin of error and 95% confidence interval. Those people who are receiving social security allowance provided by the Government of Nepal and who can actively participate in the interview while collecting the data were taken as samples. A survey questionnaire was designed to collect data from the respondents. The survey questionnaire includes three section where section A includes demographic information, section B includes basic information related to social security allowance and section C includes question related to socio-economic impact of allowance measured in Five-Point Likert scale. The reliability of Likert questions were measured by Cronbach's alpha which was found 0.889 and this value is good in SPSS reliability statistic (George & Mallery, 2003). Both descriptive analysis (percentage analysis, mean), as well as inferential analysis (t-test and ANOVA), were used for data analysis using SPSS software.

## Results and Discussion

### Demographic Profile of Respondents

The demographic characteristics for the individual respondents have been characterized through gender, marital status, education, ethnic group, occupation, living arrangement, monthly income of a family, type of social security allowance, years of receiving an allowance, and area of respondents. The summary of the demographic characteristics of respondents has been presented in Table 1.

**Table 1**

Demographic Profile of Respondents

Demographic Variables	Freq.	Percent	Demographic Variables	Freq.	Percent
<b>Gender</b>			<b>Living Arrangement</b>		
Male	70	41.2	Family	104	61.2
Female	100	58.8	Spouse	35	20.6
<b>Marital status</b>			Alone	27	15.9
Married	92	54.1	Daughter/Son-in-law	4	2.4
Divorced/separated	4	2.4	<b>Monthly Income of the family</b>		
Unmarried	5	2.9	5000 and less	52	30.6
Widow	69	40.6	5001 to 10000	24	14.1
<b>Education</b>			10001 to 20000	20	11.8
Illiterate	112	65.9	20001 to 30000	37	21.8
Basic education	49	28.8	Above 30000	37	21.8
Secondary education	4	2.4	<b>Type of social security allowance</b>		
Above secondary level	5	2.9	Old age allowance	86	50.6
<b>Ethnic Group</b>			Widow Allowance	41	24.1
Brahmin	70	41.2	Disabled Allowance	10	5.9
Chhetri	40	23.5	Dalit Allowance	33	19.4
Dalit	34	20.0	<b>Years of Receiving an allowance</b>		
Janajati	26	15.3	less than 1 year	12	7.1
<b>Major Occupation</b>			1 to 2 year	22	12.9
Agriculture	42	24.7	3 to 4 years	33	19.4
Day Labor	1	0.6	5 years and above	103	60.6
Housewife	22	12.9	<b>Area</b>		
Unemployed	86	50.6	Pokhara Metropolitan	85	50.0
Others	19	11.2	Rupa Rural Municipality	85	50.0
Total	170	100.0	Total	170	100.0

*Source: Field survey, 2020.*

The majority of the respondents are female (58.8%). Most of the respondents (54.1%) are married followed by the widow (40.6%), unmarried (2.9%), and divorced (2.4%). The highest numbers of respondents are illiterate which comprise 65.9 percent. Similarly, 28.8 percent of respondents have basic education, 2.4 percent of respondents have secondary education, and 2.9 percent of respondents have secondary education. Most of the respondents are Brahmin that composes of 41.2 percent followed by Chhetri 23.5 percent, Dalit 20 percent, and Janajati 15.3 percent.

Table 1 reveals that nearly half of the respondents are working in a different occupation such as agriculture (24.7%), as a housewife (12.9%), as labor (0.6%), and in other occupation (11.2%) and half of the respondents are not working as they are physically weak due to their old age. The highest numbers of respondents (61.2%) are living with their family and the lowest numbers of respondents (2.4%) are living with their daughter/son-in-law. Similarly, 20.6 percent of respondents live with their spouse separately and 15.9 percent of the respondents live alone.

Most of the respondents (30.6%) have a monthly family income of 5000 and fewer rupees which is followed by 20001 to 30000 rupees and above 30000 rupees, both of which comprise 21.8 percent of respondents each. Similarly, only 14.1 percent

of respondents have a family income of rupees 5001 to 10000 rupees and the lowest number of respondents (11.8%) have a monthly family income of 10001 to 20000 rupees.

The majority of the respondents are getting an old age allowance that consists of 50.6 percent. Similarly, 24.1 percent are getting widow allowance, 19.4 percent are getting a Dalit allowance and 5.9 percent are getting a disabled allowance. Most of the respondents (60.6 %) have been receiving an allowance for 5 years and above, followed by 3 to 4 years (19.4 %), 1 to 2 years (12.9 %), and less than one year (7.1 %).

### Descriptive Statistics

This section includes the mean score calculation on socio-economic well-being perceived by the beneficiaries. Different indicators are used from previous studies to measure the social-economic well-being of the beneficiaries and these indicators were finalized with the help of experts. These indicators are measured in the 5 Points Likert Scale as strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). The output of descriptive statistics is given in table 2.

**Table 2**

Descriptive Statistics of Socio-Economic Well-beings Perceived

Statements	Mean	SD
I feel that my financial dependency on others has decreased due to allowance	4.26	1.00
The allowance helps me to meet my regular household expenditure	4.04	.960
It helps to save money for future	1.92	1.01
It helps to increase health awareness	3.77	1.04
It helps to purchase health service and medicine	3.94	0.89
It helps to increase the frequency of visiting doctors	3.41	1.14
It helps to increase nutritious foods and safe drinking water	3.46	1.06
The allowance helps to increase the number of friends in some ways	3.87	1.02
The allowance helps to get involved in social activities.	3.66	0.94
Allowance has increased your importance on peers and associates	3.73	0.98
I feel honored that the government is taking care of me	4.53	0.83
I think neighbors respect me as a beneficiary of allowance	3.99	0.93
The allowance helps to increase my self-respect.	4.28	0.89
It helps to increase my food consumption	3.84	1.11
It helps to increase my health access	3.89	0.77
It helps to meet my clothing needs	3.16	1.23

(N= 170, 1 = Strongly Disagree, 3 = Neutral, and 5 = Strongly Agree)

Source: Field survey, 2020 and authors' calculation.

Table 2 presents the mean score evaluation of the scales used in assessing the social-economic well-being perceived by the beneficiaries of social security allowance. The mean scores of all the statements related to the measurement of socio-economic well-being (except one) are more than 3 which indicates that most of the respondents are agreed on social security allowance helps to get the socio-economic well-being of the respondents. The mean score of 1.92 indicates that allowance money is not sufficient to save for future emergencies



Problems faced by respondents while getting allowance

This section includes the proportion of recipients facing problems while getting an allowance and the type of problems faced by them.

Figure 1  
Problem faced by respondents

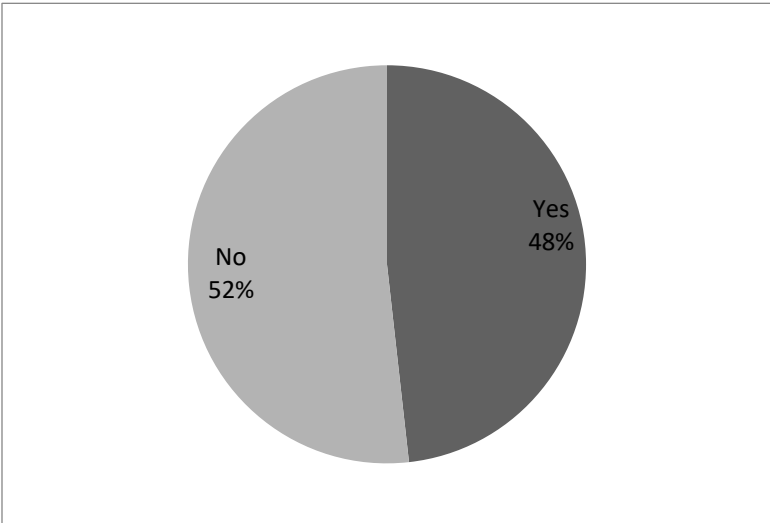


Figure 1 shows the percentage of respondents who faced problems while getting an allowance. The majority of the respondents (52 %) said that they have not faced any problem and the remaining 48 percent of respondents said that they have faced problems during the reception of their allowance.

Figure 2  
Problem related to getting the allowance.

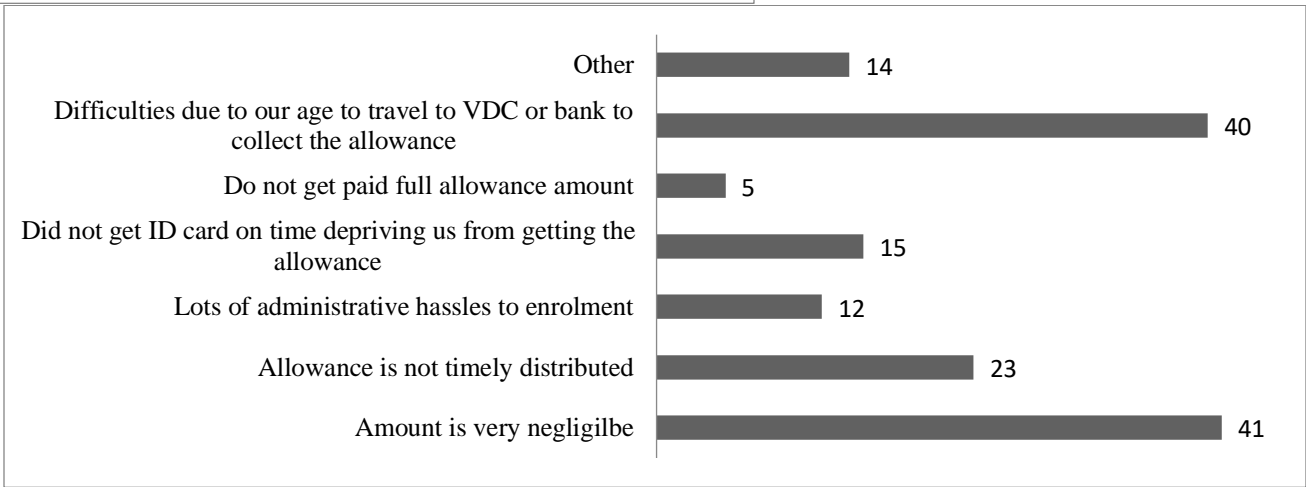


Figure 2 shows different problems faced by respondents while getting their allowance. The majority of the respondents (41 respondents) reported that the amount of allowance is very negligible followed by difficulties to travel to VDC or bank to collect the allowance which consists of 40 respondents. Likewise, other problems related to getting allowance are untimely distribution, ID card problems, a lot of administrative hassle, not getting the full amount of allowance, and others such as long queue, the problem of late receiving of allowances due to age error in the document.

### Differences in the socio-economic status of the respondents

Various factors make differences in the socio-economic status of the respondents. Independent sample t-test and one way ANOVA were applied between socio-economic status and other demographic variables such as area, gender, marital status, ethnic group, education level, working status, living arrangement, monthly income of a family, type of allowance, duration of getting an allowance, and allowance as a major source of income to find the differences in the socio-economic status of the beneficiaries.

**Table 3**

Independent Sample T-test between Male and Female

Socio-Economic Variables	Gender	N	Mean	P-value
Economic Well-being	Male	70	3.4095	0.931
	Female	100	3.4000	
Health Access	Male	70	3.7036	0.432
	Female	100	3.6025	
Social Status	Male	70	3.9286	0.020*
	Female	100	3.6300	
Self-respect & Respect from Others	Male	70	4.3381	0.330
	Female	100	4.2200	
Living Standard	Male	70	3.6619	0.711
	Female	100	3.6133	

*\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance*

*Source: Field survey, 2020 and authors' calculation.*

Table 3 shows the results of independent sample t-test by gender. There is a significant difference in social status between male recipients and female recipients ( $P < 0.05$ ). However, there is no significant difference in economic well-being, health access, respect, and living standard between male recipients and female recipients ( $P > 0.05$ ).

**Table 4**

Independent Sample T-test by Area

Socio-Economic Variables	Area	N	Mean	P-value
Economic Well-being	Pokhara Metropolitan	85	3.5098	0.048*
	Rupa Rural Municipality	85	3.2980	
Health Access	Pokhara Metropolitan	85	3.8971	0.000**
	Rupa Rural Municipality	85	3.3912	
Social Status	Pokhara Metropolitan	85	3.8745	0.056
	Rupa Rural Municipality	85	3.6314	
Self-respect & Respect from Others	Pokhara Metropolitan	85	4.2941	0.670
	Rupa Rural Municipality	85	4.2431	
Living Standard	Pokhara Metropolitan	85	3.8235	0.003**
	Rupa Rural Municipality	85	3.4431	

*\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance*

*Source: Field survey, 2020 and authors' calculation.*

Table 4 shows the socio-economic differences between the respondents of two different areas. There is a significant difference in economic well-being, health access, and living standard between the recipients of Pokhara Metropolitan and Rupa Rural Municipality ( $P < 0.05$ ). However, there is no significant difference in social status and respect between the recipients of two different areas ( $P > 0.05$ ).

**Table 5**

Independent Sample T-test by Allowance as Major Source of Income

Socio-Economic Variables	Allowance as a Major Source of Income	N	Mean	P-value
Economic Well-being	Yes	127	3.5197	0.000**
	No	43	3.0620	
Health Access	Yes	127	3.6988	0.137
	No	43	3.4826	
Social Status	Yes	127	3.7375	0.678
	No	43	3.7984	
Self-respect & Respect from Others	Yes	127	4.3360	0.050*
	No	43	4.0698	
Living Standard	Yes	127	3.7060	0.050*
	No	43	3.4186	

\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance

Source: Field survey, 2020 and authors' calculation.

Table 5 shows the socio-economic differences between the respondents by allowance as a major source of income. There is a significant difference in economic well-being, respect, and living standard between the recipients whose major income source is allowance and those who have another major source of income ( $P \leq 0.05$ ). However, there is no significant difference in health status and social status between the recipients by allowance as a major source of income ( $P > 0.05$ ).

**Table 6**

One Way ANOVA by Marital Status

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	0.248	3	.083	.167	.919
	Within Groups	82.460	166	.497		
	Total	82.708	169			
Health Access	Between Groups	3.107	3	1.036	1.544	.205
	Within Groups	111.363	166	.671		
	Total	114.469	169			
Social Status	Between Groups	3.552	3	1.184	1.747	.159
	Within Groups	112.516	166	.678		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	0.809	3	.270	.444	.722
	Within Groups	100.813	166	.607		
	Total	101.622	169			
Living Standard	Between Groups	3.906	3	1.302	1.888	.133
	Within Groups	114.460	166	.690		
	Total	118.367	169			

\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance

Source: Field survey, 2020 and authors' calculation.

Table 6 shows the results of one-way ANOVA by marital status. It is found that there is no significant difference in socio-economic variables among the recipients by the marital status ( $P>0.05$ ).

**Table 7**

One Way ANOVA by Education Level

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	0.496	3	.165	.334	.801
	Within Groups	82.213	166	.495		
	Total	82.708	169			
Health Access	Between Groups	0.831	3	0.277	.404	.750
	Within Groups	113.639	166	.685		
	Total	114.469	169			
Social Status	Between Groups	5.577	3	1.859	2.793	.042*
	Within Groups	110.491	166	.666		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	0.772	3	.257	.424	.736
	Within Groups	100.849	166	.608		
	Total	101.622	169			
Living Standard	Between Groups	1.632	3	0.544	.774	.510
	Within Groups	116.734	166	.703		
	Total	118.367	169			

*\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance*  
Source: Field survey, 2020 and authors' calculation.

The results of one-way ANOVA by education level are presented in table 7. There is a significant difference in social status among the recipients of different education levels ( $P<0.05$ ). However, there is no significant difference in economic well-being, health access, respect, and living standard among the recipients by education level ( $P>0.05$ ).

**Table 8**

One Way ANOVA by Ethnic Group

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	3.428	3	1.143	2.392	.070
	Within Groups	79.281	166	.478		
	Total	82.708	169			
Health Access	Between Groups	2.066	3	0.689	1.017	.387
	Within Groups	112.403	166	.677		
	Total	114.469	169			
Social Status	Between Groups	2.762	3	0.921	1.349	.260
	Within Groups	113.306	166	.683		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	3.769	3	1.256	2.131	.098
	Within Groups	97.853	166	.589		
	Total	101.622	169			
Living Standard	Between Groups	3.043	3	1.014	1.460	.227
	Within Groups	115.323	166	.695		
	Total	118.367	169			

*\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance*  
Source: Field survey, 2020 and authors' calculation.

Table 8 shows the results of one-way ANOVA by different ethnic groups. It is found that there is no significant difference in the socio-economic impact of allowance among the recipients of different ethnic groups ( $P>0.05$ ).

**Table 9**

One Way ANOVA by Employment Status

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	5.085	4	1.271	2.702	.032*
	Within Groups	77.624	165	.470		
	Total	82.708	169			
Health Access	Between Groups	7.156	4	1.789	2.751	.030*
	Within Groups	107.313	165	.650		
	Total	114.469	169			
Social Status	Between Groups	3.806	4	0.951	1.398	.237
	Within Groups	112.262	165	.680		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	2.662	4	.666	1.110	.354
	Within Groups	98.959	165	.600		
	Total	101.622	169			
Living Standard	Between Groups	5.339	4	1.335	1.948	.105
	Within Groups	113.028	165	.685		
	Total	118.367	169			

\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance

Source: Field survey, 2020 and authors' calculation.

Table 9 shows the results of one-way ANOVA by employment status. There is a significant difference in economic well-being and health access among the recipients of different employment statuses ( $P<0.05$ ). However, there is no significant difference in social status, respect, and living standard among the recipients of different employment statuses ( $P>0.05$ ).

**Table 10**

One Way ANOVA by Living Arrangement

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	2.337	3	.779	1.609	.189
	Within Groups	80.371	166	.484		
	Total	82.708	169			
Health Access	Between Groups	1.471	3	0.490	.720	.541
	Within Groups	112.998	166	.681		
	Total	114.469	169			
Social Status	Between Groups	3.938	3	1.313	1.943	.125
	Within Groups	112.130	166	.675		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	2.902	3	.967	1.627	.185
	Within Groups	98.719	166	.595		
	Total	101.622	169			
Living Standard	Between Groups	6.385	3	2.128	3.155	.026*
	Within Groups	111.982	166	.675		
	Total	118.367	169			

\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance

Source: Field survey, 2020 and authors' calculation.

Table 10 shows the results of one-way ANOVA by living arrangement. There is a significant difference in the living standards of the recipients by different living arrangements ( $P < 0.05$ ). However, there is no significant difference in economic well-being, health access, social status, and respect among the recipients of different living arrangements ( $P > 0.05$ ).

**Table 11**

One Way ANOVA by Monthly Family Income

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	2.529	4	.632	1.301	.272
	Within Groups	80.180	165	.486		
	Total	82.708	169			
Health Access	Between Groups	4.362	4	1.091	1.634	.168
	Within Groups	110.107	165	.667		
	Total	114.469	169			
Social Status	Between Groups	1.178	4	0.294	.423	.792
	Within Groups	114.890	165	.696		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	2.381	4	.595	.990	.415
	Within Groups	99.240	165	.601		
	Total	101.622	169			
Living Standard	Between Groups	2.481	4	0.620	.883	.475
	Within Groups	115.886	165	.702		
	Total	118.367	169			

*\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance*

*Source: Field survey, 2020 and authors' calculation.*

Table 11 presents the results of one-way ANOVA by the monthly income of the family. It is found that there is no significant difference in socio-economic status among the recipients having a different monthly family income ( $P > 0.05$ ).

**Table 12**

One Way ANOVA by Type of Allowance

Socio-Economic Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Economic Well-being	Between Groups	.711	3	.237	.479	.697
	Within Groups	81.998	166	.494		
	Total	82.708	169			
Health Access	Between Groups	4.051	3	1.350	2.030	.112
	Within Groups	110.418	166	.665		
	Total	114.469	169			
Social Status	Between Groups	1.296	3	0.432	.625	.600
	Within Groups	114.772	166	.691		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	.495	3	.165	.271	.846
	Within Groups	101.127	166	.609		
	Total	101.622	169			
Living Standard	Between Groups	1.867	3	0.622	.887	.449
	Within Groups	116.500	166	.702		
	Total	118.367	169			

*\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance*

*Source: Field survey, 2020 and authors' calculation.*

Table 12 presents the results of one-way ANOVA by type of allowance. It is found that there is no significant difference in socio-economic impact of allowance among the recipients getting different types of allowance ( $P>0.05$ ).

**Table 13**

One Way ANOVA by Years of Receiving Allowance

Socio-Economic Variables	Source of Variance	Sum of Squares	Df	Mean Square	F	Sig.
Economic Well-being	Between Groups	14.391	3	4.797	11.655	.000**
	Within Groups	68.318	166	.412		
	Total	82.708	169			
Health Access	Between Groups	32.811	3	10.937	22.234	.000**
	Within Groups	81.658	166	.492		
	Total	114.469	169			
Social Status	Between Groups	4.525	3	1.508	2.245	.085
	Within Groups	111.543	166	.672		
	Total	116.068	169			
Self-Respect & Respect from Others	Between Groups	12.283	3	4.094	7.608	.000**
	Within Groups	89.339	166	.538		
	Total	101.622	169			
Living Standard	Between Groups	19.664	3	6.555	11.024	.000**
	Within Groups	98.703	166	.595		
	Total	118.367	169			

\*\* Significant at the 1% level of significance, \* significant at the 5% level of significance

Source: Field survey, 2020 and authors' calculation.

Table 13 shows the results of one-way ANOVA by the years of receiving an allowance. There is a significant difference in economic well-being, health access, respect, and living standard of the recipients by the duration of receiving an allowance ( $P<0.05$ ). However, there are no significant differences in the social status of the recipients by the duration of receiving an allowance ( $P>0.05$ ).

## Conclusion

Social security allowance helps to increase economic well-being, health status, social status, self-respect and respect from others, and living standard of the beneficiaries in different aspects. Social security benefits play a very important role in improving the socio-economic status of the beneficiaries in different aspects.

Around half of the beneficiaries are facing some kinds of problems while getting an allowance. Difficulties to travel to Rural Municipality or bank to collect allowance and less amount of allowance are the major problems related to allowance in Nepal. Similarly, area, employment status, duration of getting an allowance, and allowance as a major source of income are the major factors that make differences in the socio-economic status of recipients. From this study, the researchers suggest to the policymakers that the amount of allowance needs to be increased at least to meet the basic requirements of the elderly and allowance should be provided on the basis of current income of the recipients.

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**Author contributions**

Conceptualization: Ranabhat D. & Adhikari Methodology: Ranabhat D. & Adhikari; Literature Review: All authors Software: Ranabhat D., Formal Analysis: Ranabhat D.; Data Collection: All authors, Writing – Original Draft: Ranabhat D., Adhikari & Sapkota, Writing – Review & Editing: Ranabhat D., Adhikari & Sapkota,

**Disclosure statement / Conflict of interest**

The authors declare no conflict of interest.

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This research did not require an ethical approval as it does not involve any human or animal experiment.

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## Community-based study on renew or dropout status of social health insurance program in Bharatpur Metropolitan City, Chitwan

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### Abstract

**Background:** Health insurance is emerging as the most preferred form of the health financing mechanism. Higher dropout puts a threat to governments target (Social health security program) of 100% enrolment by 2030. This study aimed at accessing the factors associated with current SHI status (renew or dropout) in Bharatpur metropolitan city.

**Methods:** The community based descriptive cross-sectional study using face to face interview was carried out in Bharatpur Metropolitan city, Chitwan. 342 Household head that have enrolled in Social Health Insurance for past year are considered as a sample to describe the Renewal status among SHI Enroll household. We used Pearson's chi-square test to investigate the effect of some explanatory variables on renewal and dropout status of SHI.

**Results:** Among 342 household enroll SHI scheme, there were 203(59.4%) Renewed for next year and 139(40.6%) household dropout SHI Scheme. Results shows that current status of SHI (renew or dropout) differ significantly with Sex of household head ( $P < 0.01$ ), education status ( $P < 0.01$ ), family type ( $P < 0.01$ ), highest level of education in family ( $P < 0.01$ ), presence of children ( $P < 0.001$ ), presence of pregnant women in family ( $P = 0.009$ ), presence of ageing population in family ( $P < 0.001$ ), Disability in family ( $P = 0.016$ ), Chronic disease in family ( $P < 0.01$ ).

**Conclusion:** The study concluded that the influence factors for Renew or Dropout status of SHI were: type of family, household education status, presence of children, pregnant women in family, the ageing population in family, presence of disability and chronic disease in the family.

**Keywords:** Community Based, drop out, renew, social health insurance

### Introduction

Nepal as a member of the United Nations, is committed towards Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly in September 2015. One of the goals of SDG i.e. SDG 3 focuses specifically on ensuring healthy lives and promoting well-being for all at all ages. Target 3.8 of SDG 3 achieving

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universal health coverage (UHC), including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all – is the key to attaining the entire goal as well as the health-related targets of other SDG (WHO,2016).

The constitution of Nepal 2072 has declared health as a fundamental right to its citizens ensuring “Every citizen shall have the right to free basic health services from the State, and no one shall be deprived of emergency health services (Parajuli:2020). The Government of Nepal formed a Social Health Security Development Committee as a legal framework to start implementing a social health security scheme (SHS) after the National Health Insurance Policy came out in 2013 (Pant,2017).

Health insurance is emerging as the most preferred form of health financing mechanism in situations where private out-of-pocket expenditures on health are significantly high and cost recovery strategies affect the healthcare (Gilson, 1998). The insurance mechanism helps the communities to pool their risks and transfers risks of unforeseeable healthcare costs for a pre-determined fixed premium thereby avoiding catastrophic financial burden (Griffin, 1992).

The Social Health Security Program (SHSP) is a social protection program of the Government of Nepal that aims to enable its citizens to access quality health care services without placing a financial burden on them. The SHSP is a family-based health insurance scheme implemented by the Social Health Security Development Committee. The households, communities and government are directly involved in this program. SHSP helps prevent people from falling into poverty due to health care costs i.e. catastrophic expenditure due to accidents or disease by combining prepayment and risk pooling with mutual support (Lohani,2018).

The government of Nepal had initiated Social Health Security Program from Kailali district in the FY 2072/73. The enrollment was started from 25 Chaitra 2072 and benefit policy was effective from 01 Jestha 2073. In Baglung and Ilam, enrollment process began in 15 Asar 2073 and policy was started from 01 Bhadra 2073. The program was gradually expanded in a phase-wise manner to other districts (Lohani, 2018).

In Chitwan, the registration process was started from 01 Asar 2074 and by the end of this month, the total number of enrollment was recorded to be 35,743. This population comprised 16,914 males, 18,826 females and 3 others (Lohani, 2018).

Health system in Nepal faces daunting challenges such as unequal distribution of health care services, poor infrastructures, inadequate supply of essential drugs, poorly regulated private providers, inadequate budget allocation for health, and poor retention of human resources in rural areas (Mishra,2015).

Evaluation of Nepal's earlier community-based health insurance (CBHI) schemes showed that CBHI introduced in Nepal since the 1970s suffered from low enrollment and retention of members as well as from a pro-rich bias (Mishra, 2015).

According to the National Census of 2011, the population of Nepal was 26,494, 504 and the total enrollment population of fifteen districts as per records of IMIS was 228,113. This shows that, the total insurance enrollment of Nepal by the end of FY 2073/74 was 0.86 percent (Lohani, 2018)

In context of Chitwan, about 6.23% of total household were enrolled from 01 Asar 2074 to 31 Asar 2074. The success of any health insurance program directly depends on the enrolment and renewal rates. Low enrollment and dropout are fatal for the viability of any health insurance program since decreasing risk pool and induce financial losses

Sustainability of SHI program is essential to achieve UHC and SDGs. Low enrollment and retention puts the sustainability of the scheme at risk (Mishra, 2015). Decreasing risk pool would squeeze resource mobilization and impel financial losses (Savitha, 2017).

Identification of factors that determine renewal decisions is important to redesign the scheme, its benefit package or channelize resources to remove barriers to renew. This study might provide recommendations for the improvement of Health insurance schemes within the context of the current health care financing landscape and policy development. This study would provide us with information to assess whether the program suffers from adverse selection, social exclusion and the role of socio-economic variables in renewal decisions.

## Methods

The community based descriptive cross-sectional study using face to face interview was conducted between 19<sup>th</sup> May 2019 and 19<sup>th</sup> June 2019. This study carried out in community household of Bharatpur metropolitan city, Chitwan. Sample size was calculated with prevalence 51% from previous study. According to Bhat and Jain (2007), prevalence of renewal of health insurance is 51%, allowable error (d) was 5% (Savitha, 2017). The total population (N) for the study is taken as 3097 (i.e. according to municipality profile total household of Bharatpur metropolitan city is 3097) using Cochran formula  $n = \frac{z^2pq}{e^2}$  and  $n_0 = \frac{n}{1+n/N}$  for finite population. The sample size was 342. A self-designed semi structured questionnaire was used to obtain the SHI status (renew or dropout) characteristics of the study population. Ethical clearance was obtained from CMC-IRC (Ref: CMC-IRC 075/076-138). The pre-testing was done in a study area with similarities. The reliability of this research was tested by conducting a pilot test by taking 10% of the sample and tested by using Cronbach alpha in SPSS 20. As the value of Cronbach alpha was greater than 0.8, we concluded that the research tool (questionnaire) is reliable. Validity tools tested by finding the content validity from pre-test data. The questionnaires will be translated into Nepali language.

Community household head of Bharatpur metropolitan city who enroll on SHI scheme in previous year was taken as a study population Non probability Convenience sampling techniques was used among Household head. Collected data were manually checked and entered in epi data 3.1 and exported to IBM SPSS 20.0 version software for further analysis SHI status (Renew or dropout) is assessed by the descriptive analysis of the collected information. The significant factors of SHI status (renew or dropout) were identified using Pearson Chi-square test at 5% level of significant.

## Results

**Table 1: Current SHI status (renew or dropout) among community household of Bharatpur City (n=342)**

SHI Status	Frequency (%)
Renewed	203(59.4)
Dropout	139(40.6)

Among the 342 SHI enroll households above half i.e. 203(59.4) renew the SHI scheme for next year and the remaining 139(40.6) household dropout SHI scheme.

**Table 2: Association between insurance status (renew or dropout) and socio-demographic factors of household (n=342)**

Characteristics	Number (%)	Renewed n= 203(59.4%)	Non-Renewed n= 139(40.6%)	P-value
<b>Sex</b>				
Male	213(62.28)	93(43.6)	120(56.4)	<0.01*
Female	129(37.7)	110(85.2)	19(14.8)	
<b>Marital Status</b>				
Single	37(10.9)	27(72.9)	10(27.1)	0.074
Married	305(89.1)	176(57.7)	129(42.3)	
<b>Ethnicity</b>				
Brahmin and Chettri	262(76.6)	163(62.2)	99(37.8)	0.052
Non-Brahmin/Chettri**	80(23.4)	40(50)	40(50)	
<b>Religion</b>				
Hindu	336(98.2)	200(59.5)	136(40.5)	0.0638
Non-Hindu***	6(1.8)	3(50)	3(50)	
<b>Education</b>				
Illiterate	206(60.2%)	140(67.9%)	66(32.1%)	<0.01*
Literate	136(39.8%)	63(46.3%)	73(53.7%)	

\*Denotes significant association with SHI status (Renew or dropout)(Applying parsons chi-square test at 5% level of significance). \*\* denotes janjati, Dalit.\*\*\* Buddhist, Christian and Muslim

On bivariate analysis Sex and education status of household, head were found significantly associated with the insurance status(renew/dropout) of the family (Table 3).

**Table 3: Association between social insurance status and socio-demographic factors of household (n=342)**

Characteristics	Number (%)	Renewed n= 203(59.4%)	Non-Renewed n=139(40.6%)	P-value
<b>Family Type</b>				
Nuclear	176(52)	65(36.9)	113(63.1)	<0.001*
Extended	164(48)	138(84.1)	26(15.9)	
<b>Highest Level of education in the family</b>				
Intermediate level or less	210(71.4)	84(40)	126(60)	<0.001*
University level or more	132(38.6)	119(90.1)	13(9.9)	
<b>Main Income Source</b>				
Agriculture	234(68.5)	137(58.5)	97(41.5)	0.654
Other than Agriculture**	108(32.6)	66(61.1)	42(38.9)	
<b>Children Below 5 Years</b>				
Having	82(24)	69(84.1)	13(15.9)	<0.001*
Not Having	260(75.8)	134(51.5)	126(48.5)	
<b>Pregnant women in the Family</b>				
Having	25(7.3)	21(84)	4(16)	0.009*
Not Having	320(92.7)	182(56.8)	135(43.2)	
<b>Aged Population &gt;60</b>				
Having	152(44.5)	134(88.1)	18(11.9)	<0.001*
Not Having	190(55.6)	69(36.3)	121(63.7)	
<b>Disability in the family</b>				
Having	18(5.3)	15(83.3)	3(16.7)	0.016*
Not Having	319(93.3)	183(57.3)	136(42.7)	
<b>Chronic Disease in Family</b>				
Having	164(48)	148(90.2)	16(9.8)	<0.001*
Not Having	178(52.1)	55(30.8)	123(69.2)	

\*Denotes significant association with SHI status (Renew or dropout (Applying pearsons chi-square test at 5% level of significance), \*\* denotes business, service, foreign employment.

Insurance status was showed significant association with, type of the family, highest level of education in the family, presence of children below 5 years of age, presence of pregnant women in the family, presence of aged population in the family, presence of disability in the family and presence of chronic diseases in the family (**Table 3**)

## Discussion

In this study, Insurance status in the SHI scheme was found significantly associated with sex of the household head. Previous study conducted to study enrolment factor obtained the similar result (Adhikari, 2018). However, this finding contrasts with a study conducted in rural Burkino Faso in Sub-Saharan Africa (Dong, 2009).

The effect of ethnic class was found to have no association with the insurance status of the household. This contrasts with the previous study conducted in Nepal on enrolment status (Adhikari, 2018). This study couldn't find any association between religion and insurance status in the SHI scheme, which is similar to the study mentioned above (Adhikari, 2018).

Family characteristics has major influences on dependent variable in this study, type of the family was found to be significantly associated with the insurance status, which corresponds with the systematic review of low- and middle-income countries which studied factors for uptake and sustainability of community-based health insurance (Fadlallah, 2018).

Descriptive statistics shows the higher percentage of renewal among households which have children below 5 years of age and aged population above 60 years' age. The inferential statistics also shows that the presence of children below 5 and aged population in the family is highly significant with insurance status. This result is similar to the study conducted in India (Savitha, 2014).

This research also revealed that the education status of the household head and the highest level of education influenced the insurance status of the household ( $p < 0.01$ ). This result corresponds with the study conducted in India (Savitha, 2017).

Family characteristics have major influences on the dependent variable in this study, type of the family was found to be significantly associated with the insurance status, which corresponds with the systematic review of low- and middle-income countries which studied factors for uptake and sustainability of community-based health insurance (Fadlallah, 2018).

### Conclusion

The study concluded that approximately Renewal and Dropout status is equal. The unexpected result of dropout cannot meet the aims of the social protection program of the Government of Nepal to enable its citizens to access quality health care services without placing a financial burden on them. Type of Household head, Type of family, Sex of the household head, Education status of the household head and Level of education in the family were found to influence the renew or dropout decision of the SHI. Thus the encouragement of the program towards community peoples to ensure and increase enrolment and Renew of Health insurance scheme to achieve Universal Health Coverage.

### Acknowledgments

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### Declaration of conflicting interests

The authors declare no conflict of interest.

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### Author contributions

*Conceptualization:* Subedi and Poudel. *Methodology:* Paudel and Paudel *Software:* Koirala. *Validation:* Ghimire. *Formal Analysis:* Paudel and Ghimire. *Investigation:* Subedi and Paudel; *Data Curation:* All authors. *Writing – Original Draft:* All authors. *Writing – Review & Editing:* Koirala, *Supervision:* Paudel.

### Ethical statement

This research did not require ethical approval as it does not involve any human or animal experiment.

**Data availability statement**

Data have been used only for this paper.

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## Dividends, earnings and stock prices: a case of Nepalese insurance companies

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### Abstract

The study examines the relationship among dividends, earnings and stock prices of Nepalese insurance companies. Market price per share and stock return are the dependent variables. The independent variables are earning per share, dividend per share, dividend payout ratio, PE ratio, return on assets and return on equity. This study is based on secondary data of 15 insurance companies with 105 observations for the period of 2011/12 to 2017/18. The data were collected from the annual reports of the selected insurance companies. The regression models are estimated to test the significance and importance of dividends, earnings and stock prices in Nepalese insurance companies.

The result shows that earning per share has a positive impact on market price per share and stock returns. It reveals that increase in earnings per share leads to increase in market price per share and stock returns. Similarly, PE ratio has a positive impact on market price per share and stock returns. It shows that increase in PE ratio leads to increase in market price per share and stock returns. Likewise, return on equity has a positive impact on market price per share and stock returns. Similarly, higher the return on equity, higher would be the market price per share and stock returns. The result also shows that dividend per share has a positive impact on market price per share. It indicates that increase in dividend per share leads to increase in market price per share. Similarly, dividend payout ratio has a positive impact on market price per share. It shows that increase in dividend payout ratio leads to increase in market price per share. Likewise, return on assets has a positive impact on stock return. It shows that higher the return on assets, higher would be the stock returns. However, dividend payout ratio has negative impact on stock return which reveals that higher the dividend payout ratio lower would be the stock return. Likewise, dividend per share has a negative impact on stock return which reveals that higher the dividend per share lower would be the stock return. Similarly, return on assets has negative impact on market price per share which reveals that higher the return on assets lower would be the market price per share.

**Keywords:** Earning per share, dividend per share, dividend payout ratio, price earnings ratio, return on assets, return on equity, stock return and market price per share.

### Introduction

Dividends are payments made by a company to a shareholder usually after a company earns a profit. Dividend policy is the major decisions of a firm to determine the percentage of earnings a firm pays in cash to its stockholders. It also shows the financial stability and profitability of a company (Ashamu et al., 2012). Stock price is a current price that share of stock is trading on the market. Investors generally will get the first

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information about the company through the IPO. The capital owners need to have some information related to the dynamics of stock price in order to take a decision on the company's shares to be eligible to choose (Margaretha and Isni, 2007).

A company pays dividends to reward its existing shareholders and also encourages new investors to purchase stock in a company. A company can pay dividends in the form of cash, additional shares of stock in the company or the combination of both. Thus, payment of large dividends reduces risk and influence on stock price which is roadmap for the future earnings (Gordon, 1963). Dividends serve as an announcement of the company's success because dividends are issued from a company's retained earnings. Companies that are substantially profitable issue dividends with any consistency (Gordon, 1959). Before a dividend is distributed, the issuing company must first declare the dividend amount and the date when it will be paid. It also announces the last date when shares can be purchased to receive the dividend, called the ex-dividend date. This date is generally one business days before the date of record, which is the date when the company reviews its list of shareholders (Nishat et al., 2004).

Dividend policy determines the division of earnings between payments to stockholders and reinvestment in the firm (Fama et al., 1988). Shafi (2014) found that firm size, earning per share and dividend paid have significant impact on the dividend policy. AlTroudi and Milhem (2013) found that the stock price might be affected by retained earnings per share and earnings per share. Dividends can affect the price of their underlying stock in a variety of ways. Corporate dividend policy is one of the most enduring issues in modern corporate finance.

Khan (2009) found dynamic relationship of dividends, retained earnings and other determinants with market share price. The study suggested that the overall impact of dividends on stock prices is comparatively better than that of retained earnings. Dickens et al. (2002) explained that there are differences in financial position of high dividend paying and low dividend paying companies. The study revealed that there is a positive relationship between dividends and stock prices. Further, the coefficient of dividends is higher as compared to the coefficient of retained earnings.

According to Hashemijoo et al. (2012), one of the most important decisions in corporate finance is concerned on whether the profits of firm be distributed to the shareholders as dividend or it must be reinvested in new opportunities; and if it must be distributed, what proportion of profit must be paid to shareholder and what proportion must be returned to the business. Nishat and Irfan (2004) investigated the impact of dividend policy on stock price in Pakistan. Relationship between stock price volatility and dividend policy, both of the dividend policy measures (dividend yield and payout ratio) were found to have significant impact on the stock price volatility.

Pani (2008) investigated the relationship between dividend policy and stock prices for Indian corporations. The study employed panel data analysis to examine the relationship between dividend retention

ratio and stock price behavior. The dividend retention ratio along with the size and the debt-equity ratio play a significant role in explaining variations in stock returns.

Kapoor (2009) examined the relationship between dividend policy and shareholder's value in Indian stock market. The study concluded that in the Indian scenario, dividend policy has a great effect on the shareholder wealth in the form of share price.

Hussainey et al. (2011) studied the association between dividend policy and share prices changes for the stock market in UK. The results showed that the measurements of the dividend policy, dividend yields and dividend payout, caused volatility in stock prices. Samad et al. (2007) revealed that there is a significant relationship between a stable dividend policy and firm performance in Malaysian stock market. The study suggested that there was no significant impact of dividend policy on stock market return.

Karathanassis and Philippas (1988) found that dividends, retained earnings and size to exert a significant positive influence on share prices. Uddin (2009) analyzed the effect of certain microeconomic factors on the share prices of bank, leasing and insurance companies listed on Dhaka Stock Exchange. The study found dividend, earnings and net asset value per share to bear a significant relation with share prices. Srivastava (1968) concluded that the effect of retained earnings on share prices, earnings has no significant influence on share prices. Similarly, Zahir and Khanna (1982) showed that share prices of private sector firms are significantly influenced by dividend and yield. Likewise, Krishan (2010) examined the share prices of general engineering industry and cotton textiles industry. The study found that in both the industries, book value per share and dividend are significant factors that determine share prices.

Ban et al. (2016) found that market price per share is positively related to earning per share, return on assets and return on equity. Hartone (2004) found that a significantly positive impact is made on equity prices if positive earnings information occurs after negative dividend information and vice-versa. Sharma (2011) revealed that earning per share and dividend per share have significant impact on the market price. Uwuigbe et al. (2012) concluded that financial performance and dividend payout had a significant positive relation with share prices. Dania, and Malhotra (2011) analyzed the impact of price to earnings ratio and dividend yield on the stock markets and study concluded that it has positive and significant impact on price. Dividend policy has no effect on stock price. Hence, the value of the firm in a perfect capital market will not be affected Miller et al. (1974). Mirza and Afza (2010) found that the return on assets of the company negatively affects the market price.

In the context of Nepal, Pradhan (2003) found that dividend payment is more important as opposed to retained earnings in Nepal. Manandhar (1998) found that dividend per share and return on equity have positive impact on market capitalization while earning per share, price-earnings ratio, and dividend yield have negative impact. The study also found a positive relationship between dividends and market capitalization. Dahal (2016) found that earning per share, price earnings ratio, return on assets has no significant effect in market price per share.

Sapkota (2014) found that earning per share, dividend per share, price earnings ratio, and return on assets have significant impact on market price of share. Lama (2016) found that market price per share is positively correlated to size, earning per share, dividend per share, return on assets. Nirmala et al. (2011) revealed that dividend, price-earnings ratio and leverage are significant determinants of share prices for all sectors under consideration where dividend and price earnings ratio have a positive relation to share price.

On the above background, main purpose of this study is to analyze the relationship among dividends, earnings and stock price in the context of Nepalese insurance companies. More specifically, it examines the effect of earning per share, dividend per share, price to earnings ratio, return on assets and return on equity on market price per share and stock return of Nepalese insurance companies.

The remainder of this study is organized as follows: section two describes the sample, data, and methodology. Section three presents the empirical results and final section draws the conclusion and discuss the implication of the study findings.

### Methodological aspects

The study is based on the secondary data which were gathered from 15 insurance companies with 105 observations for the period of 2011/12 to 2017/18. The main sources of data include annual reports of the selected insurance companies. Table 1 shows the number of insurance company selected for the study along with the study period and number of observations.

**Table 1: List of insurance companies selected for the study along with study period and number of observations**

Name of the insurance companies	Study period	Observation
Everest Insurance Company Limited	2011/12-2017/18	7
Himalayan General Insurance Limited	2011/12-2017/18	7
IME General Insurance Limited	2011/12-2017/18	7
LIC Nepal Limited	2011/12-2017/18	7
Neco Insurance Limited	2011/12-2017/18	7
Nepal Insurance Company Limited	2011/12-2017/18	7
National Guardian Life Insurance Company Limited	2011/12-2017/18	7
Nepal Life Insurance Company Limited	2011/12-2017/18	7
Premier Insurance Company Limited	2011/12-2017/18	7
Prudential Insurance Company Limited	2011/12-2017/18	7
Sagarmatha Insurance Company Limited	2011/12-2017/18	7
Siddhartha Insurance Limited	2011/12-2017/18	7
Surya Life Insurance Company Limited	2011/12-2017/18	7
Shikhar Insurance Company Limited.	2011/12-2017/18	7
United Insurance Company Limited.	2011/12-2017/18	7

Thus, the study is based on 105 observations.

### The model

The model used in this study assumes that market price per share depends on various insurance companies specific variables. The dependent variables are market price per share and dividend per share. The

selected independent variables are earning per share, dividend per share, dividend payout ratio, PE ratio, return on equity and return on assets. Therefore, the model takes the following forms:

Market price per share =  $f$  (earning per share, dividend per share, dividend payout ratio, price to earnings ratio, return to assets and return to equity).

Stock return =  $f$  (earning per share, dividend per share, dividend payout ratio, price to earnings ratio, return to assets and return to equity).

More specifically,

$$MPS = \beta_0 + \beta_1 EPS + \beta_2 DPS + \beta_3 DPR + \beta_4 PER + \beta_5 ROA + \beta_6 ROE + e$$

$$SR = \beta_0 + \beta_1 EPS + \beta_2 DPS + \beta_3 DPR + \beta_4 PER + \beta_5 ROA + \beta_6 ROE + e$$

Where,

MPS = Market price per share, defined as average price of share in market.

SR = Stock return, defined as the appreciation in the price plus any dividends paid, divided by its original price of stock, in percentage.

EPS = Earnings per share, defined as net income divided by total number of share outstanding, in rupees.

DPS = Dividend per share, defined as total dividend paid to total number of share outstanding, in rupees.

DPR = Dividend payout ratio, defined as the ratio of dividend per share divided by earning per share, in percentage.

PER = Price to earnings ratio, defined as the ratio of market price per share divided by earning price per share, in percentage.

ROE = Return on equity, defined as the ratio of net income divided by total equity, in percentage.

ROA = Return on assets, defined as the ratio of net income divided by total assets, in percentage.

The following section describes the independent variables and related hypotheses used in this study.

### *Earnings per share*

Earnings per share measures the amount of net income earned per share of stock outstanding. In other words, this is the amount of money each share of stock would receive if all of the profits earned by the company were distributed to the outstanding shares at the end of the year. Gordon (1959) found positive and significant relationship between earnings per share and stock price. Sharma (2011) revealed that earning per share has significant impact on the market price of share. Muhammad (2011) concluded that the equity price is positively correlated with earnings per share. Bens et al. (2003) found that there is a statistically significant relation between Earning per share changes and changes in repurchases but the relation is modest in economic terms. Balan et al. (2017) concluded that there is positive relationship between earning per share and market price. Based on it, this study develops the following hypothesis:

H1: Earning per share is positively related to market price per share and stock price.

### *Dividend per share*

Dividend per share (DPS) is an accounting ratio used to evaluate the total number of dividends declared for each share of issued stock. The issued stock taken into account is common stock. By analyzing the dividend per share of a company the investor can very well decide whether to invest in the share since it gives a clear picture about the company's profit. Azam (2011) found that the equity price is positively correlated with dividend per share. Friend and Puckett (1964) found significant impact of dividend on stock. Dividends per share are positively related to stock prices and explain the variations in the stock market prices. The study found positive relationship between dividend per share and market stock price. Chaudhary and Mohammed (2002) revealed that the dividends generally influence the share price in a positive direction. Based on it, this study develops the following hypothesis:

H2: Dividend per share is negatively related to market price per share and stock price.

### *Dividend payout ratio*

The dividend payout ratio is the amount of dividends paid to stockholders relative to the amount of total net income of a company. Pani (2008) found that there is positive relationship between dividend payout ratio and market price. Srivastava (1968) revealed that there is negative relationship between dividend payout ratio and stock price. An increase in dividend payout is effective for a firm because it enhances the market price of the share and has great impact on shareholders wealth (Asquit and Mullin, 1983). Based on it, this study develops the following hypothesis:

H3: Dividend payout ratio is negatively related to market price per share and stock price.

### *Price to earnings ratio*

The price to earnings ratio is probably the most common measure to help investors compare how cheap or expensive a firm's shares are. It's only when investors compare a firm's share price to its annual net diluted earnings per share that they can get a sense of whether a company's shares are overvalued or underpriced. Balan et al. (2017) found that there is a positive relationship between price to earnings ratio and market price. Asquit and Mullin (1983) revealed that the higher the price to earnings, the more expensive will be the company's stock. Malhotra and Tandon (2013) revealed that price-earnings ratio of 95 select companies listed on NSE-100 have positive and significant impact significantly on market price of shares.

Based on it, this study develops the following hypothesis:

H4: PE ratio is positively related to market price per share and stock price.

### *Return on assets*

Return on assets (ROA) is a financial ratio that shows the percentage of profit a company earns in relation to its overall resources. It is commonly defined as net income divided by total assets. Net income is derived from the income statement of the company and is the profit after taxes. Idawati and Wahyudi (2015) found a positive relationship between return on assets and stock price. Kabajeh and Nuaimat (2012) revealed that earning per share and returns on assets have positive and significant relationship with stock price. Kabajeh (2012) found positive relationship between the return on assets with share prices. Based on it, this study develops the following hypothesis:

H5: Return on assets is negatively related to market price per share and stock price.

#### *Return on equity*

Return on equity (ROE) is a measure of financial performance calculated by dividing net income by shareholders' equity. Kabajeh (2012) found a positive relationship between the return on equity and insurance public companies share prices. Onali (2009) found a negative relationship between return on equity and market price per share. Srivastava (1968) found significant and positive relationship between return on equity and market price per share and stock price. Subiyantoro and Andreani (2003) found stock price is influenced by return on equity. Astutik et al. (2014) revealed that return on equity have a positive effect on stock prices. Based on it, this study develops the following hypothesis:

H6: Return on equity is positively related to market price per share and stock price.

## **Results and discussions**

### *Descriptive statistics*

This table shows the descriptive statistics of dependent and independent variables of insurance companies for the study period of 2011/12 to 2017/18. The dependent variables are MPS (Market price per share, defined as the average price of share in the market) and SR (Stock return, defined as the appreciation in the price plus any dividends paid, divided by its original price of a stock, in percentage). The independent variables are EPS (Earning per share, defined as net income divided by a total number of share outstanding, in rupees), DPS (Dividend per share, defined as total dividend paid to a total number of share outstanding, in rupees), DPR (Dividend payout ratio, defined as the ratio of dividend per share divided by earning per share, in percentage), PER (Price to earnings ratio, defined as the ratio of market price per share divided by earning price per share, in percentage), ROA (Return on assets, defined as the ratio of net income divided by total assets, in percentage) and ROE (Return on equity, defined as the ratio of net income divided by total equity, in percentage). Table 2 presents the descriptive statistics of selected dependent and independent variables during the period 2011/12 to 2017/18.

**Table 2: Descriptive statistics for selected Nepalese insurance companies**

<b>Ratio</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>MPPS</b>	0.0	8.378	6.411	1.359
<b>SR</b>	-56.9	1055.220	71.009	169.108
<b>EPS</b>	-85.67	166.850	36.337	31.861
<b>DPS</b>	0.00	126.320	18.555	23.721
<b>DPR</b>	0.00	537.400	46.570	WS65.107
<b>PER</b>	-52.50	213.000	29.566	35.974
<b>ROA</b>	-26.50	124.900	8.413	13.249
<b>ROE</b>	-315.9	515.500	31.301	84.880

### *Correlation analysis*

This table shows the bivariate Pearson's correlation coefficients between the variables of selected 15 insurance companies for the study period of 2011/12 to 2017/18. The dependent variables are MPS (Market price per share, defined as the average price of a share in the market) and SR (Stock return, defined as the appreciation in the price plus any dividends paid, divided by its original price of a stock, in percentage). The independent variables are EPS (Earning per share, defined as net income divided by a total number of share outstanding, in rupees), DPS (Dividend per share, defined as a total dividend paid to a total number of share outstanding, in rupees), DPR (Dividend payout ratio, defined as the ratio of dividend per share divided by earning per share, in percentage), PER (Price to earnings ratio, defined as the ratio of market price per share



divided by earning price per share, in percentage), ROA(Return on assets, defined as the ratio of net income divided by total assets, in percentage) and ROE (Return on equity, defined as the ratio of net income divided by total equity, in percentage).

Having indicated the descriptive statistics, Pearson's correlation coefficients are computed and the results are presented in Table 3. More specifically, it shows the correlation coefficients of dependent and independent variables for selected Nepalese insurance companies.

**Table 3: Pearson's correlation coefficients matrix**

Variables	MPPS	SR	EPS	DPS	DPR	PER	ROA	ROE
MPPS	1							
SR	0.226*	1						
EPS	0.133	0.037	1					
DPS	0.266**	-0.034	0.536**	1				
DPR	0.247*	-0.099	0.077	0.661**	1			
PER	0.536**	0.069	-0.028	0.135	0.405**	1		
ROA	-0.010	0.045	0.684**	0.467**	0.051	-0.105	1	
ROE	0.073	0.045	0.185	0.211*	-0.020	-0.128	0.487**	1

*Note: The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent level respectively.*

The result shows that a earning per share has a positive relationship with market price per share which reveals that higher the earning per share, higher would be market price per share. Similarly, a dividend per share has positive relationship with market price per share. It indicates that higher the dividend per share, higher would be market price per share. Similarly, dividend payout ratio has positive relationship with market price per share. It reveals that increase in the dividend payout ratio, increases the market price per share. Likewise, price to earnings ratio has positive relationship with market price per share. It indicates that increase in the price to earnings ratio, increase the market price per share. However, return on assets has negative relationship with market price per share, indicating that higher the return on assets lower would be the market price per share. Likewise, return on equity has positive relationship with market price per share. It indicates that increase in the return on equity, increase the market price per share.

The result shows that a earning per share has a positive relationship with stock returns which reveals that higher the earning per share, higher would be stock return. However, a dividend per share has negative relationship with stock return. It indicates that higher the dividend per share, lower would be stock return. Similarly, dividend payout ratio has negative relationship with stock return. It reveals that increase in the dividend payout ratio, decrease the stock return. Similarly, price to earnings ratio has positive relationship with stock return. It indicates that increase in the price to earnings ratio, increase the stock return. Likewise, return on assets has positive relationship with market price per share, indicating that higher the return on assets higher would be the stock return. Likewise, return on equity has positive relationship with stock return. It indicates that increase in the return on equity, increase the stock return.

### Regression analysis

Having indicated the Pearson correlation coefficients, the regression analysis has been carried out and the results are presented in Table 4. More specifically, the table shows the regression results of earning per share, dividend per share, dividend payout ratio, PE ratio, return on assets and return on equity on market price per share for Nepalese insurance companies.

The results are based on panel data of 15 insurance companies with 105 observations for the period of 2011/12 to 2017/18 by using linear regression model. The model is  $MPS = \beta_0 + \beta_1 EPS + \beta_2 DPS + \beta_3 DPR + \beta_4 PER + \beta_5 ROE + \beta_6 ROA + e$ , where dependent variables are MPS (Market price per share, defined as average price of share in market) and SR (Stock return, defined as the appreciation in the price plus any dividends paid, divided by its original price of stock, in percentage). The independent variables are EPS (Earning per share, defined as net income divided by total number of share outstanding, in rupees), DPS (Dividend per share, defined as total dividend paid to total number of share outstanding, in rupees), DPR (Dividend payout ratio, defined as the ratio of dividend per share divided by earning per share, in percentage), PER (Price to earnings ratio, defined as the ratio of market price per share divided by earning price per share, in percentage), ROA (Return on assets, defined as the ratio of net income divided by total assets, in percentage) and ROE (Return on equity, defined as the ratio of net income divided by total equity, in percentage).

**Table 4: Estimated regression results earning per share, dividend per share, dividend payout ratio, PE ratio, return on assets and return on equity with market price per share**

Models	Intercept	Regression Coefficients of						Adj.R-bar <sup>2</sup>	SEE	F
		EPS	DPS	DPR	PER	ROA	ROE			
1	6.204 (30.887)**	0.006 (1.367)						0.008	1.353	1.869
2	6.128 (37.507)**		0.015 (2.796)**					0.062	1.316	7.818
3	6.170 (38.806)**			0.005 (2.796)**				0.052	1.323	6.701
4	5.812 (39.836)**				0.020 (6.443)**			0.280	1.152	41.506
5	6.419 (40.615)**					-0.001 (0.103)		0.010	1.365	0.011
6	6.374 (44.975)**						0.001 (0.744)	0.004	1.362	0.553
7	6.193 (30.550)**	0.001 (0.126)					0.001 (0.503)	0.001	1.358	1.054
8	6.137 (30.718)**	0.001 (0.126)	0.015 (2.349)*				0.000 (0.191)	0.043	1.329	2.573
9	6.028 (27.122)**	0.002 (0.367)	0.007 (0.726)	0.003 (1.114)			0.001 (0.410)	0.046	1.327	2.245
10	5.598 (28.005)**	0.000 (0.084)	0.017 (1.973)*	0.004 (1.335)	0.022 (6.367)**		0.001 (0.977)	0.316	1.124	10.614
11	5.539 (28.032)**	0.006 (1.167)	0.019 (2.301)*	0.004 (1.518)	0.021 (6.370)**	-0.030 (2.257)*	0.003 (1.940)	0.343	1.102	10.060

**Notes:**

- Figures in parentheses are *t*- values.
- The asterisk signs (\*\*) and (\*) indicate that the results are significant at 1 percent and 5 percent level respectively.
- Dependent variable is market price per share.

The result shows that the beta coefficients for earning per share are positive with market price per share. It indicates earning per share has positive impact on the market price per share. This finding is consistent with the findings of Muhammad (2011). The result also shows that the beta coefficients for dividend per share are positive with market price per share. It indicates dividend per share has a positive impact on market price per share. This finding is consistent with the findings of Muhammad (2011). Similarly, the beta

coefficients for dividend payout ratio are positive with market price per share which indicates dividend payout ratio has positive impact on market price per share. This finding is consistent with the findings of Pani (2008). Likewise, the beta coefficients for price to earnings ratio are positive with market price per share which indicates that price to earnings ratio has positive impact on market price per share. This finding is consistent with the findings of Asquit and Mullin (1983). However, the beta coefficients for return on assets are negative with market price per share. It indicates return on assets has negative impact on market price per share. The results also show that the beta coefficients for return on equity are positive with market price per share. It indicates return on equity has a positive impact on market price per share. This finding is consistent with the findings of Srivastava (1968). The result also shows that the beta coefficients for dividend per share, dividend payout ratio and price to earnings ratio is statistically significant at one percent level of significance.

Table 5 shows the regression results of earning per share, dividend per share, dividend payout ratio, PE ratio, return on assets and return on equity on stock return of Nepalese insurance companies.

The results are based on panel data of 15 insurance companies with 105 observations for the period of 2011/12 to 2017/18 by using linear regression model. The model is  $\text{stock return} = \beta_0 + \beta_1 \text{EPS} + \beta_2 \text{DPS} + \beta_3 \text{DPR} + \beta_4 \text{PER} + \beta_5 \text{ROE} + \beta_6 \text{ROA} + e$ , where dependent variables are MPS (Market price per share, defined as average price of share in market) and SR (Stock return, defined as the appreciation in the price plus any dividends paid, divided by its original price of stock, in percentage). The independent variables are EPS (Earning per share, defined as net income divided by total number of share outstanding, in rupees), DPS (Dividend per share, defined as total dividend paid to total number of share outstanding, in rupees), DPR (Dividend payout ratio, defined as the ratio of dividend per share divided by earning per share, in percentage), PER (Price to earnings ratio, defined as the ratio of market price per share divided by earning price per share, in percentage), ROA (Return on assets, defined as the ratio of net income divided by total assets, in percentage) and ROE (Return on equity, defined as the ratio of net income divided by total equity, in percentage).

**Table 5: Estimated regression results earning per share, dividend per share, dividend payout ratio, PE ratio, return on assets and return on equity with stock return.**

Models	Intercept	Regression Coefficients of						Adj. R-bar <sup>2</sup>	SEE	F
		EPS	DPS	DPR	PER	ROA	ROE			
1	63.818 (2.532)*	0.198 (0.379)						0.010	0.672	0.143
2	75.466 (3.580)**		-0.240 (0.342)					0.014	0.673	0.117
3	82.931 (4.081)**			-0.256 (1.005)				0.022	0.676	1.010
4	61.404 (2.862)**				0.325 (0.703)			0.098	0.635	0.494
5	66.192 (3.368)**					0.573 (0.456)		0.269	0.572	0.208
6	68.227 (3.862)**						0.089 (0.453)	0.148	0.617	0.205
7	62.775 (2.467)*	0.160 (0.299)					0.078 (0.388)	0.139	0.620	0.146
8	64.916 (2.526)*	0.386 (0.617)	-0.592 (0.700)				0.097 (0.478)	0.131	0.623	0.261
9	74.219 (2.587)**	0.166 (0.239)	-0.112 (0.088)	-0.288 (0.736)			0.066 (0.320)	0.269	0.572	0.330
10	60.627 (1.997)*	0.091 (0.131)	-0.416 (0.322)	-0.512 (1.207)	0.692 (1.325)		0.088 (0.423)	0.040	0.726	0.617
11	61.273 (1.991)*	0.018 (0.022)	-0.388 (0.296)	-0.507 (1.187)	0.696 (1.325)	0.325 (0.159)	0.070 (0.297)	0.031	0.898	0.514

*Notes:*

- i. *Figures in parentheses are t- values.*
- ii. *The asterisk signs (\*\*) and (\*) indicate that the results are significant at 1 percent and 5 percent level respectively.*
- iii. *Dependent variable is stock return.*

The result shows that the beta coefficients for earning per share are positive with stock return. It indicates earning per share has a positive impact on stock return. This finding is consistent with the findings of Gordon (1959). Similarly, the beta coefficients for price to earnings ratio are positive with stock return which indicates earnings ratio has a positive impact on stock return. This finding is consistent with the findings of Asquit and Mullin (1983). Likewise, the beta coefficients for return on assets are positive with stock return. It indicates the return on assets has a positive impact on stock return. This finding is consistent with the findings of Kabajeh (2012). The results also show that the beta coefficients for return on equity are positive with stock return which indicates the return on equity has a positive impact on stock return. This finding is consistent with the findings of Srivastava (1968). However, the beta coefficients for dividend per share are negative with stock return. It indicates dividend per share has a negative impact on stock return. The result also shows that the beta coefficients for dividend payout ratio are negative with stock return which indicates dividend payout ratio has negative impact on stock return. This finding is consistent with the findings of Srivastava (1968).

**Conclusion**

Insurance companies are one of the major players of the economy of Nepal. The financial performance of insurance companies is the most essential factor that can give visibility to the investor which plays a significant role to gain reliable and consistent returns by selecting winning portfolio. This study attempts to examine the dividends, earnings and stock price of Nepalese insurance companies. The study is based on secondary data of 15 insurance companies with 105 observations for the period 2012/13-2017/18.

The study shows that earning per share, dividend per share, dividend payout ratio, price to earnings ratio and return on equity have positive impact on the market price per share whereas returns on assets have negative impact on the market price per share. Similarly, dividends per share and dividend payout ratio have negative impact on stock return whereas earning per share, price to earnings ratio, return on assets and return on equity have a positive impact on stock return. The study also concludes that dividend per share followed by dividend payout ratio and price to earnings ratio are the most significant factor that determines the market price per share of Nepalese insurance companies.

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**Author contributions**

*Conceptualization:* Lamichhane; Rai. *Methodology:* Lamichhane and Rai. *Software:* Lamichhane. *Validation:* Rai. *Formal Analysis:* Lamichhane. *Investigation:* Rai. *Data Curation:* Lamichhane. *Writing – Original Draft:* Lamichhane. *Writing – Review & Editing:* Lamichhane and Rai. *Visualization:* Rai. *Supervision:* Lamichhane.

**Ethical statement**

This research did not require ethical approval as it does not involve any human or animal experiment.

**Data availability statement**

Data have been used only for this paper.

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# Factors affecting the profitability of Nepalese insurance companies

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## Abstract

This study examines the factors affecting profitability in the context of Nepalese insurance companies. Return on assets and return on equity are selected as the dependent variables. The selected independent variables are liquidity, tangibility, premium growth, firm age and firm size. The study is based on secondary data of 21 insurance companies with 168 observations for the period from 2011/12 to 2018/19. The data is collected from the reports published by Beema Samiti and Annual Reports of selected insurance companies. The regression models are estimated to test the factor affecting the profitability of Nepalese insurance companies.

The study showed that firm size has a positive impact on return on assets and return on equity. It indicates that larger firm size leads to increase in return on assets and return on equity. Likewise, premium growth has a positive impact on return on assets and return on equity. It indicates that higher the premium growth, higher would be the return on assets and return on equity. Moreover, firm age has a positive impact on return on assets. It indicates that an increase in firm age leads to increase in return on assets and return on equity. Moreover, assets tangibility has a positive impact on return of assets and return on equity. It means that higher the assets tangibility, the higher would be the return of assets and return on equity. Likewise, there is a negative impact of liquidity ratio on return on assets and return on equity. It means that an increase in liquidity ratio leads to decrease in return on assets and return on equity.

**Keywords:** *Return on assets, return on equity, liquidity, tangibility, premium growth, firm age and size.*

## Introduction

Profitability is fundamental for any firm to retain a competitive advantage and facilitate long-term prosperity. It is widely used to measure the performance of financial institutions all over the world. It is one of the most important objectives of financial management since one of the main tasks and goals of financial management is to increase shareholders' wealth. A well-developed insurance sector is a boon for economic development as it provides long-term funds for infrastructure development at the same time strengthening the risk-taking ability of the country. Financial institutions encompass a broad range of business operations within the financial services sector including banks, trust companies, insurance companies, brokerage firms, and investment dealers. It plays a significant role in the socio-economic growth and development of a nation. The insurance sector plays important role in the financial services industry in almost all developed and developing countries, contributing to economic growth, efficient resource allocation, reduction of transaction costs, creation of liquidity, facilitation of economics of scale in investment, and spread of financial losses. It plays a significant role in a country's economic growth and offers financial protection to individuals or firms against monetary losses suffered from unforeseen circumstances (Ismail, 2016). The insurance sector plays a vital role in the service-based economy and its services are now being integrated into the wider financial industry.

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Greene and Segal (2004) argued that the performance of insurance companies in financial terms is normally expressed in net premium earned, profitability from underwriting activities, annual turnover, return on investment and return on equity. Chen et al. (2009) showed that profitability of insurance companies' decrease with the increase in equity ratio. The functional status of insurers does not affect the profitability of being insured but public coverage has significant impact on profitability of insurance companies. Malik (2011) investigated the determinants of profitability in insurance companies of Pakistan. The study showed that there is a significant positive association between size of the company and profitability. The result also showed that the volume of capital is significantly and positively related to profitability. Loss ratio and leverage ratio have negative but significant relationship with profitability. Ahmed et al. (2011) found that performance of Pakistan life insurance companies is determined by size, risk and leverage.

Shiu (2004) assessed the determinants of the performance of the UK general insurance companies, over the period 1986–1999 using three key indicators: investment yield, percentage change in shareholders' funds and return on shareholders' funds. The study showed that the performance of insurers have a positive correlation with the interest rate, return on equity, solvency margin and liquidity. However, there is a negative correlation of firm performance with inflation and reinsurance dependence. Similarly, Ikonc et al. (2011) analyzed the profitability of the Serbian insurance companies by applying IMF CARMEL methodology. The study revealed that capital adequacy is vital for a company as it generate a good level of profitability. In addition, Kozak (2011) examined the determinants of the profitability of 25 general insurance companies from Poland during 2002–2009. By applying a regression model, the study found that growth of gross written premiums, operating costs reduction, GDP growth and growth of the market share of the companies with foreign ownership have a positive impact on the performance of insurance companies. Moreover, Mwangi and Murigu (2015) argued that firm size has a negative relationship with the profitability of insurance companies. However, leverage has a positive relationship with profitability.

Burca and Batrinca (2014) analyzed the determinants of the financial performance in the Romanian insurance market during the period 2008–2012. The study concluded that the underwriting risk has a negative effect on financial performance. It implies that taking an excessive underwriting risk can affect the company's stability through higher expenses. The study also showed that there is a positive linkage between firm size and the insurers' financial performance. It indicates that larger firms have more resources, better risk diversification, complex information systems and better expenses management. Moreover, the insurance financial leverage reflects the potential impact of technical reserves' deficit on equity in the event of unexpected losses and has a negative influence on the financial performance. Moreover, Curak et al. (2011) assessed the determinants of the financial performance of the Croatian composite insurers between 2004 and 2009. By applying panel data technique, the study showed that company size, underwriting risk, inflation and return on equity have a significant influence on insurers' profitability.

Almajali et al. (2012) analyzed the insurance companies listed on the Amman Stock Exchange during 2002–2007. The study showed that liquidity, leverage, company size and management competence index have a significant positive effect on financial performance of the insurers. Similarly, Pervan et al. (2012) assessed the factors affecting the profitability of the insurance companies between 2005 and 2010. By using a dynamic panel

model with GMM estimator, the study showed a significant negative influence of the loss ratio on profitability. Similarly, the study also showed a significant positive influence of age, market share and past performance on current performance. Furthermore, Mehari and Aemiro (2013) examined the impact of the Ethiopian insurance companies' characteristics on their performance. The study included 9 insurance companies which are analyzed through panel data technique during 2005–2010. The results showed that company size, loss ratio, tangibility and leverage have significant impact on the insurance companies' profitability. However, growth of gross written premiums, age and liquidity have an insignificant impact on the insurance companies' profitability.

In the context of Nepal, Upadhyaya (2020) found that firm size have positive impact on return on assets. However, leverage ratio and liquidity ratio have negative impact on return on assets. On contrary, leverage ratio has a positive impact on return on equity. Jaishi and Poudel (2021) found that leverage, firm size, liquidity and tangibility have positive and significant impact on the financial performance of Nepalese insurance companies. Pradhan and Shrestha (2015) found that liquidity is negatively and insignificantly related to return on equity. Ojha (2018) revealed that leverage has a positive and significant correlation with return on assets but negative and significant correlation with return on equity. Likewise, Pradhan (2014) found that liquidity is negatively related to firm profitability. Poudel (2019) found that there is a positive relationship of size with efficiency of bank in Nepal. In addition, Budhathoki et al. (2020) showed that bank size has a positive impact on return on assets. It indicates that larger the bank size, higher would be the return on assets. Moreover, Dahal et al. (2020) examined the liquidity management and financial performance of Nepalese insurance companies. The results showed that insurance premium has positive impact on return on assets and earnings per share. It means that increase in insurance premium leads to increase in return on assets and earnings per share. Likewise, firm size has positive impact on return on assets and earnings per share. It indicates that increase in firm size leads to increase return on assets and earnings per share. The study also concludes that insurance premium followed by current ratio and firm size is the most influencing factor that explains liquidity management and financial performance of Nepalese insurance companies.

The above discussion shows that empirical evidences vary greatly across the studies on the determinants of firm profitability. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such evidence using more recent data exists in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The main purpose of the study is to analyze the determinants of profitability of Nepalese insurance companies. Specifically, it examines the impact of firm size, liquidity, age of firm, premium growth and tangibility on return on assets and return on equity of Nepalese insurance companies. The remainder of this study is organized as follows. Section two describes the sample, data and methodology. Section three presents the empirical results and the final section draws the conclusion.

## Methodology

The study is based on the secondary data which were gathered from 21 insurance companies with 168 observations for the period from 2011/12 to 2018/19. The main sources of data include reports published by Beema Samiti and Annual Reports of selected insurance companies. Table 1 shows the list of insurance companies selected for the study along with the study period and number of observations.

**Table 1: List of insurance companies selected for the study along with study period and number of observations**

Name of the insurance companies	Study period	Observations
Premier Insurance Company (Nepal) Limited	2011/12-2018/19	8
Siddhartha General Insurance Limited	2011/12-2018/19	8
Shikhar Insurance Company Limited	2011/12-2018/19	8
Neco Insurance Limited	2011/12-2018/19	8
Lumbini General Insurance Limited	2011/19-2018/19	8
NLG Insurance Company Limited	2011/19-2018/19	8
Nepal Insurance Company Limited	2011/12-2018/19	8
United Insurance Limited	2011/12-2018/19	8
Prudential Insurance Company Limited	2011/12-2018/19	8
Prabhu Insurance Company Limited	2011/12-2018/19	8
Everest General Insurance Limited	2011/12-2018/19	8
Sagarmatha General Insurance Limited	2011/12-2018/19	8
IME General Insurance Limited	2011/12-2018/19	8
Himalayan General Insurance Limited	2011/12-2018/19	8
Gurans Life Insurance Limited	2011/12-2018/19	8
Asian Life Insurance Limited	2011/12-2018/19	8
Prime Life Insurance Limited	2011/12-2018/19	8
Nepal Life Insurance Company Limited	2011/12-2018/19	8
Life Insurance Cooperation (Nepal) limited	2011/12-2018/19	8
Surya Life Insurance Limited	2011/12-2018/19	8
National Life insurance Company Limited	2011/12-2018/19	8

Thus, the study is based on the 168 observations.

#### *The model*

The model used in this study assumes that firm profitability depends on different firm specific variables. The selected independent variables are firm size, liquidity, age of firm, premium growth and tangibility. The dependent variables are return on assets and return on equity. Therefore, the following model equations are designed to test the hypothesis.

$$ROA_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TA_{it} + \beta_3 FS_{it} + \beta_4 AF_{it} + \beta_5 PG_{it} + e_{it}$$

$$ROE_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TA_{it} + \beta_3 FS_{it} + \beta_4 AF_{it} + \beta_5 PG_{it} + e_{it}$$

Where,

ROA = Return on assets is measured as the ratio of net income to total assets, in percentage.

ROE = Return on equity is measured as the ratio of net income to shareholder equity, in percentage.

LIQ = Liquidity is measured as the ratio of current assets to current liabilities.

TA= Tangibility assets is measured as the total fixed assets to total assets, in percentage.

PG= Premium growth is measured by the percentage growth of gross written premiums, in percentage.

FS = Firm size is measured as natural logarithm of total assets of insurance companies.

AF=Age of the company is measured as natural logarithm of the number of years from the date of establishment.

The following section describes the variables used in this study along with hypothesis formulation.

### *Return on assets*

ROA provides good information about a firm's financial performance in the terms of using assets to create income. Xuezhui and Dickson (2012) found that bank's profitability has negative relationship with the core capital ratio. However, Kleff and Weber (2008) revealed that the capital level is positively correlated to the return on assets. Likewise, Bektas (2014) found a positive relationship between bank risk and capitalization. Lamberg and Valming (2009) suggested that the adaptation of liquidity strategies have an insignificant impact on ROA. Only increased use of liquidity forecasting and short-term financing during financial crisis had a positive impact on ROA. Ismail (2016) found that liquidity variables such as current ratio and cash conversion cycle have significant positive impact on profitability (ROA).

### *Return on equity*

ROE measures a company's profitability which reveals how much profit a company generates with the money shareholders have invested. Arbiyan and Safari (2009) found a positive relationship between short-term debts and profitability (ROE) but a negative relationship between long-term debts and ROE. Mohd-Zaid et al. (2014) found that liquidity and size have significant relationships with ROE. Shil et al. (2015) revealed that there is negative significant relationship between volume of capital and leverage with financial performance (ROE) and there is insignificant positive relationship of tangibility and liquidity with financial performance (ROE).

### *Firm size*

Upadhyaya (2020) found that firm size have positive impact on return on assets. Poudel (2019) found that there is a positive relationship of size with efficiency of bank in Nepal. In addition, Budhathoki et al. (2020) showed that bank size has a positive impact on return on assets. However, Browne et al. (2001) found that the company size has a positive relationship with the financial performance of life insurance companies. Similarly, Dey et al. (2015) assessed the factors determining financial performance of life insurance companies of India. The study revealed that there is a positive relationship between financial performance and size of insurance companies. Cooke (1992) examined the impact of size, stock market listing and industry type on disclosure in the annual reports of Japanese listed corporations. The study suggested that there is a significant and positive relationship between company size and performance. In addition, Athanasoglou et al. (2008) asserted that increase in company size increases the performance of the bank. Furthermore, Almajali et al. (2012) argued that the size of the firm can positively affect its financial performance. Based on it, this study develops the following hypothesis:

H1: There is a positive relationship between firm size and firm profitability.

### *Liquidity*

Pradhan and Shrestha (2015) found that liquidity is negatively and insignificantly related to return on equity. Similarly, Pradhan (2014) found that liquidity is negatively related to firm profitability. Likewise, Eljelly (2004) examined the association between profitability and liquidity of joint stock companies in Saudi Arabia using correlation and regression analysis. The study revealed that there is a negative relationship between liquidity and profitability of Saudi companies. Similarly, Molyneux and Thornton (1992) and Goddard et al.

(2004) found a negative relationship between liquidity and profitability for European banks in the late 1980s and mid-1990s, respectively. The study argued that, holding liquid assets imposes an opportunity cost on the bank given their low return relative to other assets, thereby having a negative effect on profitability. According to Panigrahi (2014), increasing profitability would tend to reduce firm's liquidity and too much attention on liquidity would tend to affect the profitability. Lyroudi and McCarty (1993), using the listed companies of London Stock Exchange for 4 years period, revealed that the cash conversion cycle, current ratio and the quick ratio have a negative association with the profitability ratios like net profit ratio, return on assets and the return on equity. Based on it, this study develops the following hypothesis:

H2: There is a negative relationship between liquidity and firm profitability.

#### *Tangibility assets*

Pradhan *et al.* (2020) found that tangibility assets have a positive impact on the Nepalese Insurance companies. Likewise, Mehari and Aemiro (2013) examined the firm specific factors that determine insurance companies' performance in Ethiopia. The study revealed that there is a positive relationship between tangibility and profitability of insurance companies. Similarly, Cekrezi (2013) found that tangibility has a significant positive effect on firm profitability. Moreover, Bhutta and Hasan (2013) examined the impact of firm specific and macroeconomic factors on profitability of food sector in Pakistan. The study revealed that tangibility, growth of the firm and inflation are positively related to profitability. Kodongo *et al.* (2015) investigated the relationship between leverage and the financial performance of listed firms in Kenya. The results showed that asset tangibility, sales growth and firm size are important determinants of profitability. The study also concluded that asset tangibility has a positive relationship with the firm profitability. Based on it, this study develops the following hypothesis:

H<sub>3</sub>: There is a positive relationship between assets tangibility and firm profitability.

#### *Firm age*

Pradhan *et al.* (2020) found that firm age has a positive impact on the profitability of Nepalese Insurance companies. Likewise, Lumpkin and Dess (1999) found that there is a positive relationship between companies' age and profitability. Pervan *et al.* (2012) assessed the factors affecting the profitability of the insurance companies between 2005 and 2010. The study found that there is positive relationship between firm age and profitability. Moreover, Malik (2011) found that there is significantly positive relationship between company size and profitability in the context of Pakistani firms. Moreover, Sorensen and Stuart (2000) argued that companies age affect the firm's performance. Further, the study argued that organizational inertia operating in old firms tends to make them more efficient and profitable. In addition, Liargovas and Skandalis (2008) reported that older firms are more skilled since they have enjoyed the benefits of learning and not prone to the liabilities of newness, hence they have a superior performance. Based on it, this study develops the following hypothesis:

H4: There is a positive relationship between firm age and firm profitability.

### Premium growth

Premium revenue is the primary source of revenue for most insurers. Using a dynamic panel model with GMM estimator, Dahal et al. (2020) examined the liquidity management and financial performance of Nepalese insurance companies. The results showed that insurance premium has positive impact on return on assets and earning per share. Moreover, Pervan et al. (2012) showed that there is positive relationship between premium growth rate and firm profitability. Furthermore, Akotey et al. (2013) analyzed the financial performance of life insurance companies in Ghana. The study indicated that gross premiums have a positive relationship with the profitability of insurance. Similarly, Kripa and Ajasllari (2016) assessed the factors affecting the profitability of insurance companies in Albania. The study found that the growth rate is positively associated with profitability. Based on it, this study develops the following hypothesis:

H5: There is a positive relationship between premium growth and firm profitability.

## Results and discussion

Table 2 presents the descriptive statistics of the selected dependent and independent variables during the period 2011/12 to 2018/19. This table shows the descriptive statistics of dependent and independent variables of 21 Nepalese insurance companies for the study period from 2011/12 to 2018/19. The dependent variables are ROA (Return on assets is measured as the ratio of net income to total assets, in percentage) and ROE (Return on equity is measured as the ratio of net income to shareholder equity, in percentage). The independent variables are LIQ (Liquidity is measured as the ratio of current assets to current liabilities), TA (Tangibility assets is measured as the total fixed assets to total assets, in percentage), PG (Premium growth is measured by the percentage growth of gross written premiums), FS (Firm size is measured as total assets of insurance companies, Rs in billion) and AF (Age of the company is measured as the number of years from the date of establishment, in years).

**Table 2: Descriptive statistics of variables**

Variables	Minimum	Maximum	Mean	Std. Deviation
ROA	-113.00	54.17	11.02	14.80
ROE	-505.11	100.70	12.45	46.39
TA	0.40	84.00	12.41	17.91
LIQ	0.05	31.00	3.40	4.08
PG	-44.0	98.54	24.07	22.11
AF	5.0	71.00	18.87	12.58
FS	0.12	73.74	5.24	11.26

Source: SPSS output

Table shows the bivariate Pearson's correlation coefficients of dependent and independent variables of 21 Nepalese insurance companies for the study period from 2011/12 to 2018/19. The dependent variables are ROA (Return on assets is measured as the ratio of net income to total assets, in percentage) and ROE (Return on equity is measured as the ratio of net income to shareholder equity, in percentage). The independent variables are LIQ (Liquidity is measured as the ratio of current assets to current liabilities), TA (Tangibility assets is

measured as the total fixed assets to total assets, in percentage), PG (Premium growth is measured by the percentage growth of gross written premiums), FS (Firm size is measured as total assets of insurance companies, Rs in billion) and AF (Age of the company is measured as the number of years from the date of establishment, in years). Having indicated the descriptive statistics, Pearson's correlation coefficients are computed and the results are presented in Table 3.

**Table 3: Pearson's correlation coefficients matrix**

Variables	ROA	ROE	TA	LIQ	PG	AF	FS
ROA	1						
ROE	0.649**	1					
TA	0.179*	0.201**	1				
LIQ	-0.116	-0.264**	-0.223**	1			
PG	0.067	0.047	0.088	0.620	1		
AF	0.151*	0.098	-0.081	0.079	-0.007	1	
FS	0.180*	0.172*	0.158*	-0.326**	-0.057	-0.303**	1

*Note:* The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent levels respectively.

Table 3 shows that firm size is positively correlated to return on assets. It indicates that larger firm size leads to increase in return on assets. Likewise, premium growth is positively correlated to return on assets. It indicates that higher the premium growth, higher would be the return on assets. Moreover, firm age is positively to return on assets. It indicates that increase in firm age leads to increase in return on assets. Moreover, assets tangibility is positively correlated to return of assets. It means that higher the assets tangibility, higher would be the return of assets. Likewise, there is a negative relationship between liquidity ratio and return on assets. It means that increase in liquidity ratio leads to decrease in return on assets.

On the other hand, firm size is positively correlated to return on equity. It indicates that larger the firm size, higher would be the return on equity. It indicates that increase in firm age leads to increase in return on equity. Similarly, premium growth has a positive relationship with return on equity. It reveals that increase in premium growth leads to increase in return on equity. Moreover, assets tangibility is positively correlated to return on equity. It means that higher the assets tangibility, higher would be the return on equity. Likewise, there is a negative relationship between liquidity ratio and return on equity. It means that increase in liquidity ratio leads to decrease in return on equity.

#### *Regression analysis*

Having indicated the Pearson's correlation coefficients, the regression analysis has been carried out and results are presented in Table 4. The results are based on panel data of 21 insurance companies with 168 observations for the period from 2011/12-2018/19 by using the linear regression model and the model is  $ROA_{it} = \beta_0 + \beta_1 TA_{it} + \beta_2 LIQ_{it} + \beta_3 PG_{it} + \beta_4 AF_{it} + \beta_5 FS_{it} + e_{it}$  where, the dependent variable is ROA (Return on assets is measured as the ratio of net income to total assets, in percentage). The independent variables are LIQ (Liquidity is measured as the ratio of current assets to current liabilities), TA (Tangibility assets is measured as the total fixed assets to total assets, in percentage), PG (Premium growth is measured by the percentage growth of gross written premiums), FS (Firm size is measured as total assets of insurance companies, Rs in billion) and AF (Age of the company is measured as the number of years from the date of establishment, in years). More specifically, it

shows the regression results of tangibility, liquidity, premium growth, firm age and firm size on return on assets of Nepalese insurance companies.

**Table 4: Estimated regression of tangibility, liquidity, premium growth, firm age and firm size with return on assets**

Model	Intercept	Regression coefficients of					Adj. R_bar <sup>2</sup>	SEE	F-value
		TA	LIQ	PG	AF	FS			
1	11.078 (6.188) **						0.061	14.852	5.008
2	9.577 (6.934) **	0.117 (1.837)					0.014	14.704	3.374
3	14.481 (10.105) **		-1.015 (3.761) **				0.073	14.262	14.152
4	10.941 (8.017) **			0.003 (0.114)			0.006	14.851	0.013
5	10.905 (5.268) **				0.006 (0.071)		0.006	14.852	0.005
6	12.558 (10.187) **					0.322 (3.234) **	0.054	14.485	8.642
7	10.397 (5.749) **	0.833 (1.964) *					0.011	14.722	1.929
8	16.671 (6.961) **	0.985 (1.967) *	-1.097 (3.762) **				0.084	14.171	9.113
9	16.104 (6.421) **	0.909 (1.962) *	-1.096 (3.751) **	0.05 (0.178)			0.079	14.213	14.572
10	16.526 (5.400) **	0.989 (1.985) *	-1.107 (3.734) **	0.006 (0.163)	0.022 (0.242)		0.073	14.252	13.644
11	17.723 (5.702) **	0.997 (1.986) *	-0.884 (2.850) **	0.040 (0.164)	0.012 (0.138)	0.273 (2.536) *	0.103	14.092	14.209

*Notes:* Figures in parenthesis are t-values. The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent levels respectively. Return on asset is the dependent variable.

Table 4 shows that the beta coefficients for firm size are positive with return on assets. It indicates that firm size has a positive impact on return on assets. This finding is similar to the findings of Dey et al. (2015). Similarly, the beta coefficients for firm age are positive with return on assets. It indicates that firm age has a positive impact on return on assets. This finding is consistent with the findings of Pervan et al. (2012). Similarly, the beta coefficients for assets tangibility are positive with return on assets. It indicates that assets tangibility has a positive impact on return on assets. This finding is consistent with the findings of Kodongo et al. (2015). Likewise, the beta coefficients for liquidity ratio are negative with return on assets. It indicates that liquidity ratio has a negative impact on return on assets. This finding is similar to the findings of Panigrahi (2014).

Table 5 shows the regression results of leverage, tangibility, liquidity, premium growth, firm age and firm size on return on assets of Nepalese insurance companies. The results are based on panel data of 21



insurance companies with 168 observations for the period from 2011/12-2018/19 by using the linear regression model and the model is  $ROE_{it} = \beta_0 + \beta_1 TA_{it} + \beta_2 LIQ_{it} + \beta_3 PG_{it} + \beta_4 AF_{it} + \beta_5 FS_{it} + e_{it}$  where, the dependent variable is ROE (Return on equity is measured as the ratio of net income to shareholder equity, in percentage). The independent variables are LIQ (Liquidity is measured as the ratio of current assets to current liabilities), TA (Tangibility assets is measured as the total fixed assets to total assets, in percentage), PG (Premium growth is measured by the percentage growth of gross written premiums), FS (Firm size is measured as total assets of insurance companies, Rs in billion) and AF (Age of the company is measured as the number of years from the date of establishment, in years).

**Table 5: Estimated regression of tangibility, liquidity, premium growth, firm age and firm size with return on equity**

Model	Intercept	Regression coefficients of					Adj. R_bar <sup>2</sup>	SEE	F-value
		TA	LIQ	PG	AF	FS			
1	15.901 (2.856) **						0.114	46.181	10.861
2	9.076 (2.097) *	0.230 (1.956)					0.025	46.114	1.340
3	16.220 (3.507) **		-1.259 (1.985) *				0.076	46.011	8.094
4	12.424 (2.920) **			0.018 (0.210)			0.016	46.297	1.045
5	10.432 (1.617) *				0.080 (0.280)		0.012	46.291	1.084
6	19.199 (12.455) **					0.394 (1.965) *	0.053	45.084	6.545
7	14.202 (2.515) *	0.331 (1.570)					0.088	45.986	11.667
8	22.553 (2.991) **	0.269 (1.262)	-.1562 (1.960) *				0.118	45.744	12.044
9	22.254 (2.873) **	0.266 (1.241)	-1.566 (1.969) *	0.021 (0.243)			0.113	45.877	11.547
10	20.933 (2.120) *	0.278 (1.281)	-1.508 (1.977) *	0.081 (0.218)	0.122 (0.413)		0.128	45.986	15.277
11	23.277 (2.326) *	0.300 (1.382)	-1.018 (1.961) *	0.018 (0.219)	0.141 (0.477)	0.478 (1.972) *	0.112	45.874	11.340

Notes: Figures in parenthesis are t-values. The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent levels respectively. Return on equity is the dependent variable.

Table 5 shows that the beta coefficients for premium growth are positive with return on equity. It indicates that premium growth has a positive impact on return on equity. This finding is similar to the findings of Kripa and Ajasllari (2016). Similarly, the beta coefficients for firm size are positive with return on equity. It indicates that firm size has a positive impact on return on equity. This finding is consistent with the findings of Athanasoglou et al. (2008). Similarly, the beta coefficients for assets tangibility are positive with return on equity. It indicates that assets tangibility has a positive impact on return on equity. This finding is consistent with the findings of Cekrezi (2013). Likewise, the beta coefficients for liquidity ratio are negative with return on equity. It indicates that liquidity ratio has a negative impact on return on equity. This finding is similar to the findings of Lyroudi and McCarty (1993).

## Conclusion

Good performance of a company determines the position of the company in its market and the growth and consolidation of the market. Profitability is one of the most important objectives of financial management, since one of the main tasks and goals of financial management is to increase shareholders wealth. The variation of profits between insurance companies over the years, within a country, leads to believe that internal factors or specific factors of a firm play a major role in determining profitability. This study attempts to analyze the factors affecting the profitability of Nepalese insurance companies. This study is based on secondary data of 21 insurance companies with 168 observations for the study period from 2011/12 to 2018/19.

The study showed that tangibility, premium growth, firm age and firm size have positive impact on return on assets of Nepalese insurance companies. The study also showed that tangibility, premium growth, firm age and firm size have positive impact on return on equity. However, liquidity ratio has a negative impact on return on equity and return on assets of Nepalese insurance companies. The study concluded that leverage followed by liquidity is the most influencing factor that explains the changes in the return on equity. Likewise, the study also concluded that liquidity followed by firm size is the most influencing factor that explains the changes in the return on assets in the context of Nepalese insurance companies.

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## Author contributions

*Conceptualization:* Sah; Magar. *Methodology:* Sah; Magar. *Software:* Sah. *Validation:* Sah. *Formal Analysis:* Sah. *Investigation:* Magar. *Data Curation:* Sah. *Writing – Original Draft:* Sah. *Writing – Review & Editing:* Sah; Magar. *Visualization:* Magar. *Supervision:* Magar.

## Ethical statement

This research did not require ethical approval as it does not involve any human or animal experiment.

## Data availability statement

Data have been used only for this paper.

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# Financial performance of Nepalese insurance companies

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## Abstract

This study examines the financial performance of Nepalese insurance companies. The dependent variables are return on assets and earnings per share while independent variables include insurance premium, firm size, current ratio and solvency ratio. Twenty-one insurance companies among them 8 are life insurance and 13 are non-life insurance companies with 105 observations for the period of 2070/71 to 2074/75, were selected for this study. The data were collected from insurance and financial statistics published by beema samiti and annual reports of the selected Nepalese insurance companies. The correlation coefficient and regression models were estimated to test the significance and importance of liquidity management on financial performance of Nepalese insurance companies.

The results shows that insurance premium has positive impact on return on assets and earning per share. It means that increase in insurance premium leads to increase in return on assets and earnings per share. Likewise, firm size has positive impact on return on assets and earning per share. It indicates that increase in firm size leads to increase return on assets and earnings per share. Similarly, current ratio has negative impact on return on assets. It means that increase in current ratio leads to decrease in return on assets. Likewise, solvency ratio has negative impact on return on assets. It indicates that increase in solvency ratio leads to decrease in return on assets. Similarly, current ratio have positive impact on return on assets. It means that increase in current ratio leads to increase in earnings per share. Likewise, solvency ratio has positive impact on earnings per share. It indicates that higher solvency ratio, higher would be the earnings per share. The study also concludes that insurance premium followed by current ratio and firm size is the most influencing factor that explains liquidity management and financial performance of Nepalese insurance companies.

**Keywords:** Liquidity management, firm performance, return on assets, earnings per share, insurance premium, firm size, current ratio and solvency ratio.

## Introduction

The liquidity management duty is to determine the needs for funds to meet financial obligation and ensure the availability of cash or collateral to fulfill those needs as at when due, this is done by coordinating the various sources of funds available to the institution under normal and stressed condition (Chen and Wong, 2004). Niresh (2012) explained that the banking liquidity management is simply to meet financial commitment whether it is withdrawing from a current from a current account or interbank deposit or a maturing issues of commercial paper.

Insurance liquidity means an insurance having money where they need it particularly to satisfy the withdrawal needs of the customers (Wasiuzzaman and Tarmizi, 2010). Liquidity management is very important

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for every organization that means to pay current obligations on business, the payment obligation includes operating and financial q that are short term how ever increasing in long term debt (Saleem and Reheman, 2011). The business has adequate liquid assets in the direction to meet payment programs by compare the cash and near cash among payment obligations on the other side. If the coverage of current liabilities by cash and near cash is insufficient, it indicates that business might find difficulties in meeting immediate financial liabilities (Olagunju et al., 2011).

Managing liquidity risk is to insure the insurance companies own liquidity so that the company can continue to serve its function (Vossen and Ness, 2010). The assessment of the liquidity management in relation to performance becomes imperative as a result of insurance market review in 2009. Theoretical studies and empirical evidence have shown that countries with better developed financial system enjoy faster and more stable long-run growth of which insurance companies contribute (Biet, 2003).

Bouwknegt and Pelsser (2002) opined that at establishing the liquidity risk and its effect of financial performance of listed insurance companies. The study also found that operational, market and credit risks has negative effect on the financial performance of these companies. Profitability and liquidity are effective indicators of the corporate health and performance of not only insurance companies, but all profit-oriented Ventures. The cash assets generally consist of receivables from customers and inventories of complete goods and unprocessed materials (Bhunja, 2012). Liquidity plays a crucial role in successful operation of a banking and insurance business. Every stakeholder is interested in the liquidity position of an insurance company. Thus, banking and insurance firms should safeguard that it does not hurt from lack of or excess liquidity to cover up its short term obligations (Kurawa and Abubakar, 2014). Likewise, Gonga and Sasaka (2017) found that liquidity had an insignificantly positive impact on firm's financial performance.

Molyneux and Thornton (1992); Goddard et al. (2004) found a diverse evidence of a negative relationship between the two variables for European banks in late 1980's and mid-1990's respectively. According to Adebayo et al. (2011), there is significant relationship between liquidity and profitability. According to Mathuva (2009), there is positive relationship between profitability and liquidity of insurance company in Kenya. Similarly, Bagchi (2013) found that there is a negative relationship between the measures of liquidity management and firms' profitability. Bank's liquidity is positively related to profitability and negatively related to the size of the bank and interest margin (Vodova, 2013). Al-Tamini and Obeidat (2013); Lartey et al. (2013) revealed that there is positive relationship between liquidity management and profitability. Likewise, Ericsson and Renault (2005) developed a structural bond valuation model simultaneously capture liquidity and credit risk. The model implies that renegotiation in financial distress is influenced by the illiquidity of the market for distressed debt.

Ramzam and Zafar (2014) revealed statistically positive and significant relationship of assets base or size of the bank with liquidity risk in the estimated hypothetical model. Likewise, Berger and Goldberg (2004) argued that there is positive relationship between bank size and profitability. Profitability is more likely to improve emulating industry best practice in terms of technology and management structure than by increasing the size. Similarly, Demirguc-Kunt(1998) found that foreign insurance and banks have more profitability than domestic banks in developing countries while in developed countries. Same as, Chirwa (2003) examined that

there is a negative relationship between profitability and capital adequacy ratio and gearing ratio. Likewise, Chen et al. (2010) showed that bank size, liquidity and interest income have positive effect on the bank's profitability, but credit risk and loans have a negative effect on the banks' profitability.

In the context of Nepal, stability of insurance sector helps to maintain stability in the economy (Baral, 2005). Likewise, Joshi (2004) found that the liquidity and insurance companies are positively related to insurance profitability. Same as, Maharjan (2007) revealed that the capital adequacy and liquidity is positively associated with the insurance profitability. Likewise, Shrestha (2012) found positive and significant association between liquidity and profitability of banks of Nepal. Similarly, Pradhan and Shrestha (2016) revealed negative relationship between quick ratio and profitability measured in terms of return on equity. Likewise, Poudel (2012) found an inverse impact on banks' financial performance; however the default rate is the most predictor of bank and financial institutions performance. Same as, Jha (2012) showed that the liquidity position has negative impact on financial performance.

The major purpose of study is to examine the financial performance of Nepalese insurance companies. More specifically, it determines the relationship of current ratio, gross premium, firm size and solvency ratio on return on assets and earnings per share of Nepalese insurance companies.

## Methods

The study is based on secondary data. The necessary secondary data are collected from Annual financial statements Insurance Companies and Annual reports of the selected Nepalese insurance companies. The data have been collected for the period of 2070/71 to 2074/75, leading to a total of 105 observations. This study is based on descriptive and causal comparative research designs. Table: 1 shows the number of insurance companies selected for the study along with study period and the number of observations.

**Table 1: Number of insurance companies selected for the study along with study period and the number of observations**

Name of Insurance Companies	Study Period	Observation
Rastra Beema Sanstan	2070/71 to 2074/75	5
Prime Life Insurance Company Limited	2070/71 to 2074/75	5
National Life Insurance Company Limited	2070/71 to 2074/75	5
Asian Life Insurance Company Limited	2070/71 to 2074/75	5
Guras Life Insurance Company Limited	2070/71 to 2074/75	5
Nepal Life Insurance Company Limited	2070/71 to 2074/75	5
Life Insurance Corporation Limited	2070/71 to 2074/75	5
Met Life Insurance Company Limited	2070/71 to 2074/75	5
NLG Insurance Company Limited	2070/71 to 2074/75	5
Siddhartha Insurance Limited	2070/71 to 2074/75	5
United Insurance Company Limited	2070/71 to 2074/75	5
Sagarmatha Insurance Company Limited	2070/71 to 2074/75	5
Himalayan General Insurance Company Limited	2070/71 to 2074/75	5
IME General Insurance Company Limited	2070/71 to 2074/75	5
Prudential Insurance Company Limited	2070/71 to 2074/75	5

Everest Insurance Company Limited	2070/71 to 2074/75	5
Lumbini General Insurance Company Limited	2070/71 to 2074/75	5
Neco Insurance Limited	2070/71 to 2074/75	5
Prabhu Insurance Company Limited	2070/71 to 2074/75	5
Nepal Insurance Company Limited	2070/71 to 2074/75	5
Premier Insurance Company Limited	2070/71 to 2074/75	5

Thus, this study is based on the 105 observations.

#### *The Model*

The study assumes that the insurance performance depends upon different variables. The dependent variables selected for the study are earning per share and return on assets. Similarly, the selected independent variables are firm size, current ratio, solvency ratio and insurance premium. To explain the influence of the independent variables on the dependent variables, multiple regression analysis was used. Therefore, the following model equation is designed to test the hypothesis.

Performance = f (firm size, current ratio, solvency ratio and insurance premium).

More specifically, the given model has been segmented into following models;

$$ROA = \beta_0 + \beta_1 FS + \beta_2 CR + \beta_3 SOL + \beta_4 IP + e$$

$$EPS = \beta_0 + \beta_1 FS + \beta_2 CR + \beta_3 SOL + \beta_4 IP + e$$

In the above model, the dependent variable is the earning per share indicated by the earning available to equity holder to number of share.

Where,

ROA = Return on assets, defined as the profit after tax to average assets, in percentage.

EPS= Earnings per share, defined as the earning available to equity holder to number of share.

FS= Firm size, defined as the total size of assets.

CR= Current ratio, define as current assets divided by current liabilities.

SOL= Solvency ratio, defined as the company's ability to meet its debt obligations

IP= Insurance Premium, defined as total premium collected.

The following section describes the independent variables used in this study along with hypotheses.

#### *Current ratio*

Current ratio indicates the bank's market liquidity and measures the ability of bank to meet the short term obligation. It is calculated by dividing current assets by current liabilities (Bhunia, 2012). There is positive and statistically significant association between current ratio and bank profitability (Ismail, 2016). There is a positive relationship between the firm's profitability and liquidity levels as measured by current ratio (Ajanthan, 2013). According to Muda et al. (2013), there is positive relationship between the liquid ratio and profitability of the firm. Similarly, Godwin and Moses (2015) indicated that the liquidity management indicator i.e. liquid assets to total asset ratio have positive impact on the bank profitability. Same as, Bourke (1989) found positive and significant relationship between liquidity risk and profitability. Based on it, this study develops the following hypothesis:

H1: There is a positive relationship between current ratio and financial performance.



### *Firm size*

Size refers to bank size that is considered as total assets. Larger company has larger market share and market power in respect of customers and volume of investment (Berger and Goldberg, 1997). Likewise, Nireesh (2012) concluded that firm size has positive impact on performance of firm. Similarly, Butt and Hasan (2009) determined a positive and significant relationship between firm size and financial performance. According to Sufain et al. (2009), there is a positive impact of firm size on performance. Similarly, the effect of bank size on profitability is found to be positive (Simrlock, 1985). Firms' size has a strong positive affiliation with profitability (Bagchi, 2013). Based on it, this study develops the following hypothesis:

H2: There is a positive relationship between firm size and financial performance.

### *Insurance premium*

Premium is the amount of money that an individual or a business must pay for an insurance policy (Chaudhari and Kiran, 2011). Likewise, Burca and Batrinca (2014) found that there is positive influence of premium on the return on assets. According to Kaya (2015), profitability of non-life insurance companies is statistically and positively related to the premium collected. Similarly, Jibrán et al. (2016) found that there is positive relationship between premium and profitability. Same as, Suheyli (2015) found that premium has a positive and statistically significant relationship with profitability. Likewise, Lire (2016) revealed a positive relationship between premium and profitability. Based on it, this study develops the following hypothesis:

H3: There is a positive relationship between insurance premium and financial performance.

### *Solvency ratio*

Solvency ratio is the ability of a company to meet its long term fixed expenses and to accomplish long term expansion growth. A solvency ratio greater than 20% is considered financially healthy. The higher ratio better equipped a company is to pay off its debts and survive in the long term (Bawa, 2013). According to Gulati and Jain (2011), there is positive and significant relationship of solvency ratio and financial performance. Similarly, Chaudhary and Kiran (2011) observed a positive relationship of solvency with financial performance of insurance companies. Likewise, Khidmat and Rehman (2014) showed that the solvency ratio has positive and highly significant impact on the financial performance of firms. Same as, Obudho (2014) established that solvency risk was positively affect the financial performance of insurance companies in Kenya. Based on it, this study develops the following hypothesis:

H4: There is a positive relationship between the solvency ratio and financial performance.

## **Results and Discussion**

### *Descriptive statistics*

This table shows the statistics of the dependent variable and independent variable. Dependent variables are ROA (return on assets as net income divided by total assets) and EPS (earning per share as net income after tax is divided a total number of shareholders) and independent variables are IP (insurance premium specified as premium collected), FS (firm size specified as total assets of firm), CR (Current ratio specified as current assets divided by current liabilities), SOL (Solvency ratio specified as total equity divided by total liabilities). The described statistics are based on the data from 21 sample insurance companies with

105 observations for the period 2070/71 to 2074/75. Table 2 presents the descriptive statistics of selected dependent and independent variables during the period 2070/71 to 2074/75.

**Table 2: Descriptive statistics for selected Nepalese insurance companies**

Variables	N	Minimum	Maximum	Mean	Std. Deviation
ROA	105	10	22.67	15.58	9.91
EPS	105	0.00	100.81	34.36	20.48
IP	105	14.34	22.30	19.25	1.62
FS	105	18.52	26.84	21.63	1.51
CR	105	0.04	27.60	2.30	3.56
SOL	105	9.89	26.44	12.12	6.16

### Correlation analysis

Having indicated the descriptive statistics, Pearson correlation coefficients are computed and the results are presented in Table 3. This table shows the Pearson correlation coefficients among different dependent variables and independent variables. Dependent variables are ROA (return on assets as net income divided by total assets) and EPS (earning per share as net income after tax is divided a total number of shareholders) and independent variables are IP (insurance premium specified as premium collected), FS (firm size specified as total assets of firm), CR (Current ratio specified as current assets divided by current liabilities) and SOL (Solvency ratio specified as total equity divided by total liabilities).

**Table 3: Pearson correlation coefficients matrix**

Variables	ROA	EPS	IP	FS	CR	SOL
ROA	1					
EPS	-0.068	1				
IP	0.148	0.303**	1			
FS	-0.001	-0.111	0.119	1		
CR	-0.125	0.274**	0.317**	0.127	1	
SOL	-0.140	0.167	0.131	0.234*	0.311**	1

*Note: The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent levels respectively.*

Table 3 shows that there is positive relationship between insurance premium and earning per share. It indicated that higher the insurance premium, higher would be the earning per share. Similarly, firm size is negatively related to with earning per share. It indicates that increase in firm size leads to decrease in earnings per share. Likewise, current ratio is positively correlated to earning per share. It indicates that increase in current ratio leads to increase in earnings per share. Similarly, solvency ratio is positively related to earning per share. It indicates that higher the solvency ratio, higher would be the earnings per share.

The positive relationship between insurance premium and return on assets also observed. It indicated that higher the insurance premium, higher would be the return on assets. Similarly, firm size is negatively related to with return on assets. It indicates that increase in firm size leads to decrease in return on assets. Likewise, current ratio is negatively correlated to return on assets. It indicates that increase in current ratio leads to decrease in return on assets. Similarly, the solvency ratio is negatively related to earnings per share. It indicates that higher the solvency ratio, the lower would be the return on assets.

*Regression analysis*

Having indicated the Pearson correlation coefficient, the regression analysis has been carried out and the results are presented on table 4. More specifically, it shows the regression results of insurance premium, firm size, current ratio and solvency ratio in the financial performance of Nepalese insurance companies.

**Table 4: Estimated regression results of insurance premium, firm size, current ratio, and solvency ratio on return on assets**

Model	Intercept	IP	FS	CR	SOL	Adj. R <sub>bar</sub> <sup>2</sup>	SEE	F
1	2.529 (0.749)	0.265 (1.519)				0.012	2.8989	2.3
2	2.609 (6.293)**		0.164 (1.721)			0.24	2.6812	5.32
3	2.815 (8.334)**			-0.102 (-1.279)		0.006	2.9029	1.636
4	2.788 (8.773)**				-0.098 (-1.431)	0.01	2.8965	2.04
5	-3.985 (-1.121)	0.365 (1.98)*		-0.155 (-1.864)		0.028	2.8701	2.99
6	3.274 (6.666)**			-0.066 (-0.78)	-0.104 (-1.367)	0.009	2.8985	3.98
7	-4.211 (-0.821)	0.374 (2.038)*	0.002 (0.012)	-0.156 (-1.864)		0.027	2.8719	2.95
8	-5.185 (-1.001)	0.378 (2.065)*	0.045 (0.232)	-0.128 (-1.47)	-0.087 (-1.194)	0.031	2.8659	1.821

Notes:

- i. Figures in parenthesis are t-values
- ii. The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent level respectively.
- iii. Return on assets is dependent variable.

The results are based on panel data of 21 insurance companies with 105 observation for the period of 2070/71 to 2074/75 by using regression model. The model is  $EPS = \alpha + \beta_1 LEV + \beta_2 FS + \beta_3 CR + \beta_4 SOL + \beta_5 IP + e$  where EPS (earning per share as net income after tax is divided total number of shareholders) is the dependent variable and independent variable are IP (insurance premium specified as natural logarithm of premium collected), FS (firm size specified as natural logarithm of total assets of firm), CR (Current ratio specified as current assets divided by current liabilities) and SOL (Solvency ratio specified as total equity divided by total liabilities). Table 4 shows that beta coefficients for insurance premium are positive with return on assets. It indicates that insurance premium has positive impact on return on assets. This finding is consistent with the findings Kaya (2015). Likewise, the beta coefficients for firm size are positive with return on assets. It indicates that firm size has positive impact on return on assets. This finding is similar to Butt and Hassan (2009). Likewise, the beta coefficients for current ratio are negative with return on assets. It indicates that current ratio has positive impact on return on assets. This finding is consistent with the findings Bourke (1989). Similarly, the beta coefficients for solvency ratio are negative with return on assets. It indicates that solvency ratio has negative impact on return on assets. This finding is similar to the finding of Obudho (2014).

**Table 5: Estimated regression results of insurance premium, firm size, current ratio, and solvency ratio on earning per share**

Model	Intercept	IP	FS	CR	SOL	Adj. R <sub>bar</sub> <sup>2</sup>	SEE	F-Value
1	-39.308 (-1.717)	3.826 (3.23)**				0.083	19.6165	10.433
2	66.962 (2.326)*		1.507 (1.135)			0.003	20.4584	1.28
3	20.732 (13.336)**			1.574 (2.891)**		0.66	19.7983	8.35
4	32.616 (14.647)**				0.821 (1.718)	0.018	20.2974	2.95
5	18.96 (0.556)	3.222 (2.639)**	2.288 (1.823)	1.233 (2.214)*		0.13	19.1102	6.174
6	26.834 (8.032)**			1.338 (2.334)*	0.686 (1.327)	0.074	19.7182	3.75
7	70.631 (2.365)*		2.003 (1.475)	1.409 (2.465)*	0.775 (1.497)	0.084	19.6043	4.39
8	3.374 (2.764)**	9.753 (2.268)*	2.172 (1.651)	0.928 (1.598)	0.795 (1.584)	0.141	18.9843	4.423

Notes:

- i. Figures in parenthesis are t-values
- ii. The asterisk signs (\*\*) and (\*) indicate that the results are significant at one percent and five percent level respectively.
- iii. Earnings per share is dependent variable.

Table 4 shows that beta coefficients for insurance premium are positive with earning per share. It indicates that insurance premium has positive impact on earnings per share. This finding is consistent with the findings Lire (2016). Likewise, the beta coefficients for firm size are positive with earning per share. It indicates that firm size has positive impact on earnings per share. This finding is similar to Simrlock (1985). Likewise, the beta coefficients for current ratio are positive with earning per share. It indicates that current ratio has positive impact on earnings per share. This finding is consistent with the findings Bourke (1989). Similarly, the beta coefficients for solvency ratio are positive with earning per share. It indicates that solvency ratio has positive impact on earnings per share. This finding is similar to the finding of Gulati and Jain (2011).

## Conclusion

The issue of liquidity management is receiving serious attention all over the world especially with the current financial situations and the state of the world economy. Some of the striking corporate goals include the need to maximize profit maintaining high level of liquidity in order to guarantee safety. Many study like; Olagunji et al., (2011) and Kurawa and Abubakar (2014) have established that profitability and liquidity management need purposeful attention from adequate financial intermediation. Liquidity is the statistically significant predictor of firms' profitability. Every stakeholder has interest in the liquidity situation of insurance company. So, insurance firm should ensure that it does not suffer from lack of or excess liquidity to cover up its short-term obligations. This study attempts to examine the financial performance of Nepalese insurance companies. The study is based on secondary data of 21 insurance companies of 105 respondents.

The study shows that insurance premium, firm size, current ratio and solvency ratio have positive impact on earnings per share. Likewise, insurance premium, firm size have positive impact with return on

assets. However, current ratio, and solvency ratio have negative impact with return on assets. The study concludes that higher the insurance premium and current ratio leads to higher would be the financial performance. The study also concludes that insurance premium followed by current ratio and firm size is the most influencing factors that explains the financial performance of Nepalese insurance companies.

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#### **Author contributions**

*Conceptualization:* Pradhan. *Methodology:* Pradhan. *Software:* Dahal. *Validation:* Dahal. *Formal Analysis:* Pradhan; Dahal. *Investigation:* Dahal. *Data Curation:* Dahal. *Writing – Original Draft:* Dahal. *Writing – Review & Editing:* Dahal. *Visualization:* Pradhan. *Supervision:* Pradhan.

#### **Ethical statement**

This research did not require ethical approval as it does not involve any human or animal experiment.

#### **Data availability statement**

Data will be available upon reasonable request from the corresponding author.

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