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Research Article

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Affordability of The Proposed Social Health Insurance And Its Associated Factors Among Public Instituations Servants in Metekel Zone, Benishangul Gumuze Regional State, North West, Ethiopia

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Abstract

Chinese painting restoration blends artistry and heritage preservation. While AI offers new solutions, current methods struggle to replicate its unique style and often overlook restorers' practical needs. This gap hinders the effective preservation of its historical and cultural value. To address this, our study explores AI's potential in this field, developing InkRenew, an AI-assisted restoration system. Leveraging deep learning, InkRenew integrates dynastic and stylistic knowledge to provide real-time restoration guidance. A controlled experiment with 34 novice restorers compared AI-assisted and traditional methods, evaluating restoration quality, accuracy, and user experience. The results showed that InkRenew significantly enhanced efficiency and precision while reducing operational burden, demonstrating high usability and acceptance. Theoretically, this work bridges AI and traditional restoration, proposing a digital preservation framework. Practically, it offers restorers an efficient tool, and culturally, it advances intelligent heritage conservation. This research provides an innovative approach to safeguarding and disseminating cultural heritage.

Keywords: Ancient Painting Restoration, Cultural Heritage, Generative AI, Digitization, Human-AI Interaction.

1. Introduction

Background

In most of developing countries the out-of-pocket payment for health care service has been accounting over 40% of their expenditure and this limits the poor from accessing the health care and leads them to complicated health problems [1].

In Ethiopia, promising improvement was seen in the domestic share of health expenditure, but household out-of-pocket (OOP) spending is 33%, which continues to be a serious domestic source. Over 73% of the population pays for health care from their OOP, and the total per capita of OOP expenditure of households for health was 231 ETB per annum, but this value is different regarding residency; the average per capita OOP was higher in urban than rural [2,3].

Due to the above problem health care purchase become catastrophic in Ethiopia. For example, 55% of OOP spending is financed by their household's own cash, 35 % financed through assistance from friends and relation, while 6% was financed through selling the household's own livestock and cereals and 4% were by borrowing money [3].

Because of the above reasons, reducing OOP payment is one of the

health care financing strategies of the government of Ethiopia to facilitate the journey to universal health coverage (UHC).

About reducing OOP payment, the proposed initiative is strengthening the ongoing Community Health Insurance scheme and implementing the proposed Social Health Insurance scheme [4]. Regarding Community-based Health Insurance (CBHI), 39% (375 woredas) were enrolled, in line with the Health sector transformation plan (HSTP) target. About 3,084,036 households or 15,638,789 beneficiaries were enrolled into CBHI in 2009 EFY, but Social health insurance was expected to commence and achieve full enrolment of the target population starting from the first years of HSTP. However, its implementation was delayed due to reasons like the need to improve quality of health [4].

2. Methods

2.1. Study Period

The study was conducted from March 17 to April 17, 2021in Metekel zone.

2.2. Study Area

Metekel Zone is located in the Benishangul-Gumuz Region of Ethiopia, named after the former Metekel province. Which is found 570 km in North West of Addis Ababa. Administratively, the zone is structured into seven districts that are (Pawie, Mandura, Wombera, Debati, Dangur, and Guba), having 7 urban and 97 rural villages.

2.3. Source Population

All public civil servants who were working in the public sector in the Metekel zone.

2.4. Study Population

All Public civil servant workers who were working in selected public sectors in Metekel Zone were the study population.

2.5. Study Unit

The study units were selected individuals in the selected public sectors in Metekel Zone.

2.6. Inclusion Criteria

Permanent public employees who work in the institution and who are present during the time of data collection.

2.7. Exclusion Criteria

Employer who gets a scholarship and those who have private insurance.

3. Sample Size Determination

The required sample size was computed using single population proportion formula for assuming the dependent variable "Affordability", by considering the prevalence as 50%, 95% confidence interval (1.96), with margin of error (5%).

3.1. Sampling Technique and Procedure

A multistage stratified random sampling technique was used to select study participants. The first stratum categorized public servants of the town in to three strata that was higher academic Institutions, health facilities, servants, and the town administration office servants. Using the lottery method among three public health facilities.

4.Variables

4.1. Dependent Variable

Affordability of SHI

4.2. Independent Variables

4.2.1. Socio-Demographic Factors

Sex, age, marital status, number of family members, income, level of education, and work sector.

4.3. Health Status and Health Expenditure Factors

history of illness in the household in the last 12 months, seek medical treatment, and get treatment, place of treatment, reasons for going to treatment, health care costs, coverage of the household for the health care costs, means of getting money for health care, and any health care coverage.

4.4. Individual Factors

4.4.1. Attitude on the Importance of SHI

Agreement on mandatory service of SHI, Agreement on the use of SHI to improve health care quality and agreement on payment of SHI.

4.4.2. Knowledge of the Benefits of SHI

Source of information on SHI, the type of social network they involve.

4.5. Operational Definition and Measurement

4.5.1. Operational Definition

4.5.2. Net Income: cumulative of monthly salary and monthly income from other sources.

4.5.3. Affordability: affordability is a function of income, spending, and judgments about the value of goods and services for their price.

4.6. Measurement of the Dependent Variable Affordability

Although the "affordability" of health care is a common concern, the term is rarely defined. Fundamentally, affordability is a function of income, spending, and judgments about the value of goods and services for their price.

About economic measurement of affordability, we used for normative approach, which states "afford" to pay for health insurance if it would have minimum income left to meet its other socially-defined minimum needs, such as food and shelter. Normative affordability only depends on income being greater than a fixed amount, and when income equals this fixed amount, consumers choose an "ideal" allocation of all the goods in the economy. Hence, this considers the proposed SHI premium

contribution, the federal Poverty line (FPL), and family size. According to the 2015/16 poverty analysis of Ethiopia, the poverty line is Birr 7184 per year per person. When the net income after covering the poverty line could cover the proposed 3% of the SHI premium, then the scheme is affordable for the individual. According to the review of concepts to guide policy makers, the affordability of the scheme was assessed as below.

If net income- [household size *(per capita _income less poverty line)] >3% of gross salary, the person can afford to pay 3% of their gross salary for SHI. If net income- [household size *(per capita _income less poverty line)] <3% of gross salary, the person cannot afford to pay 3% of their gross salary for SHI.

4.7. Measurements of the Independent Variable

4.7.1. Measuring Health Status and Health Expenditure

In this study, Health status and health expenditure factors can be measured using nine questions. Yes or no question, multiple choice question on the type of health facility and money spent for moderate health care, by asking their payment type whither they pay by OOP or other means like borrowing money and types of benefit they get from their organization.

4.7.2. Attitude Toward SHI Scheme

In this study, perception towards SHI was measured using 4 items of questions with a five-point Likert scale (1: strongly disagree, 2: disagree, 3: No opinion, 4: agree, and 5: strongly agree). The sum of these items yields a total score of a minimum of 4 and a maximum of 20, with a mean score of 13.02. if participants scored ≥13, we considered them as having "good perception", otherwise as "poor perception" about SHI.

4.7.3. Knowledge of SHI

In this study, Knowledge of social health insurance was assessed by using a set of 5 questions about social health insurance. Respondents who had a score greater than or equal to the mean score (mean score: 6.19) were considered as having "good knowledge" about SHI, otherwise as "poor knowledge".

5. Data Collection Tool and Procedure

5.1. Data Collection Tool

Data were collected using a structured pre-tested questionnaire. The questionnaire was prepared in English and translated into Amharic. A gain changed back to English to check for consistency. Both closed-ended and open-ended questions were used. The questionnaire contains four sections: socio-demographic variables (age, sex, marital status, religion, educational status, occupation, and work experience), health status and expenditure variables, knowledge & perception towards SHI, and monthly income variables.

5.2. Data Collection Procedure

The data collection process took place from March 17 - April 17/2021, by using structured questionnaires. Intensive three-day training was given for data collectors and supervisors on data collection tools, cleaning, precautions to be taken while collecting, the approach, and the most common mistakes committed during data collection. Then, after using the Amharic version questionnaire, six diploma holders and two supervisors were used for data collection.

5.3. Data Quality Control

Data consistency and completeness were checked and data entry were done in daily basis by assigned supervisors and immediate correction was taken. Moreover, principal investigator and supervisors were made supervision on the data collection process to check the accuracy and validity of the questionnaire, pre-testing of the questionnaire were be done in Pawi preparatory school on five percent (5%) of the actual sample prior to the actual study period. After pretesting the questionnaire, Cronbach's Alpha was calculated by using SPSS window version 25 to test internal consistency (reliability) of the item. In addition, the questionnaires were checked for completeness and consistency in daily basis. In case of absent participants during the survey, there were three times re-visit were done and non- respondent will be considered otherwise. Moreover, the collected data were be cleaned, coded and entered to EPI data version 4.6.

5.4. Data Processing and Analysis

After the data were collected, the Data were checked for completeness and entered into the EPI data v. 4.6 software package. Then it was exported to SPSS version 25 statistical software package for cleaning, coding, and analysis. Descriptive and inferential data analysis were conducted. The descriptive statistics were described using frequency, percentage, mean, and standard deviation, and will be presented by a figure, table, and text; all continuous independent variables were categorized. An inferential analysis to identify factors associated with the Affordability of SHI was carried out. The binary logistic regression model was fitted as a primary method of analysis. The odds ratio (OR) was computed with the 95% confidence interval (CI) to see the Affordability of SHI with associated factors in this research. Multicollinearity among independent variables was checked using Variable Inflation Factor (VIF), and variables with a VIF value of 10 or above were considered to have multicollinearity. Model fitness was checked using the Hosmer and Lemeshow test, and its adequacy was confirmed as =0.84. Independent factors, with a P-value <0.25, were candidate variables for multivariable analysis. In the multivariable logistic models with a 95% confidence level and p-value, less than 0.05 was considered a significant factor for the Affordability of SHI.

5.5. Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board (IRB) of the University of Gondar, College of Medicine and Health Sciences, Institute of Public Health (Ref. No: IPH/1469/2013). After a brief explanation of the objectives and purpose of the study, informed consent was obtained from each study participant. Participants were informed that participation was voluntary and they had the right to stop their participation at any time. Study participants were also informed that all data obtained from them would be kept confidential by using codes instead of any personal identifiers.

6. Results

6.1. Socio-Demographic Characteristics of the Respondents

In this study, 925 respondents participated with a response rate of 95%. The majority of the respondents, 358(38.7%), were in the age group of 25-29 years, whereas the mean age was 32 years with (±6.8 SD). In case of sex, 577(62.4%) were male and 655(70.8%) were married. About 595(64.4%) were Orthodox Christians followed by 188(20.3%) Muslim. It was found that 294(1.8%) were under a family size of 1-2, and the average was 3 (±1.560SD). More than half, 520(56.2%) were BSc/BA holder and 363(39.2%) of them are Administrative Staff with mean service year 8.3(±6.269 SD) (Table-1).

Variables	Category	Frequency(n)	Percent (%)
Age (years)	20-24 25-29 30-34 35-39 >39	50 358 279 117 121	5.4 38.7 30.2 12.6 13.1
Sex	Male Female	577 348	62.4 37.6
Marital Status	Never Married Married Divorce Widowed	239 655 20 11	25.8 70.8 2.2 1.2
Religion	Orthodox Muslim Protestant Adventist	595 188 129 19	64.3 20.3 13.9 1.4
Family Size	1-2 2-4 >4	294 427 204	31.8 46.2 22.1
Educational Level	Certificate and below Diploma BSc/BA Masters and above	30 297 520 78	3.2 32.1 56.2 8.4
Occupation	Academic Staff Supportive Staff Health Professional Administrative Staff	83 153 326 363	9.0 16.5 35.2 39.2
Service Year (years)	1-5 5-10 10-15 >15	357 335 104 129	38.6 36.2 11.2 13.9

Table 1: Socio-Demographic Characteristics of the Respondent Among Formal Public Servants in Metekel zone, Benishangul-Gumuz Regional State, 2021

6.2. Health Status and Health Expenditure of the Respondent

One-third of respondents got sick in the 12-month recall period and received health care. It was found that, 263(28.4%) visited the public hospital. Beside, 310(33.5%) spends less than 1000 ETB and 764(82.6%) covered their health care expenditure from their OOP, whereas 73(9.2%) forced to borrow many from relatives. Whereas 433(46.9%) get organizational support while they get sick (Table-2).

Variables	Category	Frequency(n)	Percent (%)
Got sick in the last 1-year	Yes No	380 545	41.1 58.9
Got health care	Yes No	351 29	37.9 3.1

Types of health facilities to get health care	Health Center Hospital Private clinic Traditional Healer	35 263 56 3	3.8 28.4 6.1 0.3
Birr spent for modern health care in last 1- year	<1000 (1) >1001 (2)	310 47	33.5 5.1
Covered all from OOP	Yes No	764 161	82.6 17.7
Means of getting money for treatment	Borrowing Money From monthly salary	73 707	9.2 89.0
Organization benefit while get sick	Yes No	433 491	46.9 53.1

Table 2: Health and Health Expenditure Status of the Respondents Among Formal Public Servants in Metekel zone, Benishangul-Gumuz Regional State, 2021

7. Individual Factor of the Respondent

7.1. Attitude Toward the SHI Scheme

The study revealed that only 119(12.9%) & 23(2.5%) of the respondent of the respondent Strongly Agree and strongly Disagree on the importance of introduction of Social Health insurance but more than half of the respondent 669(72.3%) Agree on the importance of introduction of SHI, beside this 382(41.3%) and 351(37.9%) disagree and Agree respectively on the mandatory of SHI.

About 460(49.7%) of the respondent believed that Introduction of SHI will improve the quality of health care, Whereas 235(25.4%) of the respondent did not Agree on this idea. 297(32.1%) of the respondent Agree that SHI should give without personal contribution, whereas majority of them 435(49.2%) believe that everyone should contribute 3% their gross salary (Table-2).

Variables	Category	Frequency(n)	Percent (%)
Do you Agree on Importance of introducing SHI	Strongly Disagree Disagree No Opinion Agree Strongly Agree	23 57 57 669 119	2.5 6.2 6.2 72.3 12.9
Do you Agree SHI to be mandatory	Strongly Disagree Disagree No Opinion Agree Strongly Agree	48 382 75 351 69	5.2 41.3 8.1 37.9 7.5
Do you Agree SHI will improve Quality of health care	Strongly Disagree Disagree No Opinion Agree Strongly Agree	28 235 137 460 65	3.0 25.4 14.8 49.7 7.0
Do you Agree SHI will give without personal contribution	Strongly Disagree Disagree No Opinion Agree Strongly Agree	50 455 76 297 47	5.4 49.2 8.2 32.1 5.1

Table 3: Attitude of the Respondents About Shi Scheme Among Formal Public Servants in Metekel Zone, Benishangul-Gumuz Regional State, 2021

Generally, more than half of the total respondents, 522(56.4%), have “Poor Attitude” toward SHI, whereas 403(43.6%) of the respondents have “Good Attitude” toward SHI with a mean value of 13. (Figure-1)

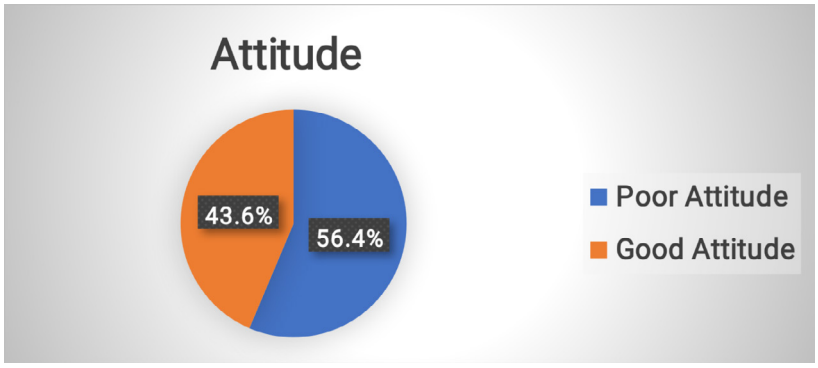

Figure 1: Attitude of the Respondents Towards Shi Among Formal Public Servants in Metekel Zone, Benishangul-Gumuz Regional State, 2021, (n = 925)

7.2. Knowledge of the SHI Scheme

It is found that 751(81.2%) respondents had heard about SHI. Beside this 174 (18.8%) were never heard about SHI. From this 329(35%) respondents regularly get information about SHI from Social media like the internet, radio, TV and 620 (67%) were participate in social Network like Edire, Ekub. More than Half of the respondent 607 (65.6%) knows about the benefit of SHI (Table-4).

Variables	Categories	Frequency	Percent (%)
Did you hear about SHI	Yes No	751 174	81.2 18.8
Source of information	Social media (internet, radio, TV) Friends Government announcement and newspaper Workshops/training/meeting	329 105 250 67	35.6 11.4 27 7.2
What do you know about SHI	Benefit package Premium contribution	607 145	65.6 15.7
Do you involve in social Network	Yes No	620 305	67.0 33.0
Types of social network	Edire Ekub	291 329	31.5 35.6

Table 4: Knowledge of Respondents About SHI Scheme Among Formal Public Servants in Metekel Zone, Benishangul-Gumuz Regional State, 2021

The study revealed that 539(58.3%) of respondent have "Poor knowledge" toward SHI, Were as only 386(41.7%) of respondent "Good Knowledge" about Social health insurance. With mean value of 6.19.

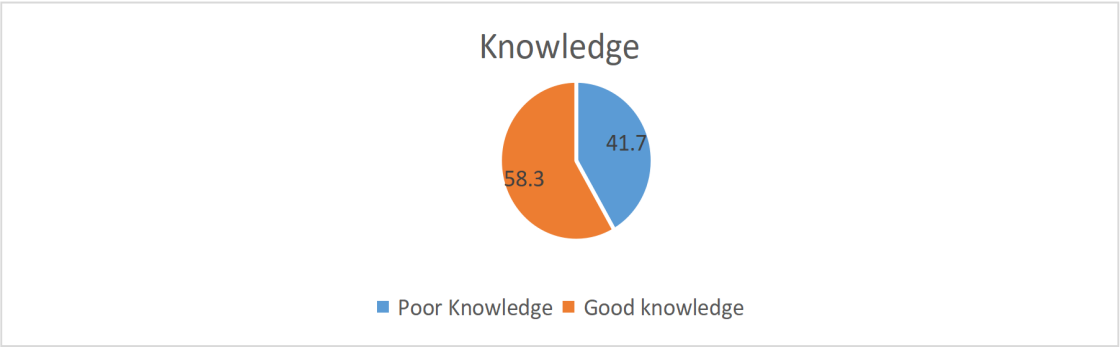

Figure 2 : knowledge Level of the Respondents Towards Shi Among Formal Public Servants in Metekel Zone, Benishangul-Gumuz Regional State, 2021, (n=925)

7.3. Affordability of the Newly Proposed SHI

With regard to net income, 351(37.9%) had monthly net income of 6000-10000 ETB; 303(32.8%) had greater than or equals to 10000 ETB, Whereas 271(29.31%) had monthly income less than 6000 ETB. In addition, 459(49.6%) of the respondent have additional income from other family members. In addition, 370(40%) had additional income rather than which complement monthly salary and all of them can afford the scheme when compared to that of respondents living with salary alone. Out of the total respondents, 905 (97.8%) were able to afford the newly proposed 3% of gross salary per month as SHI scheme premium, Participant working as administrative staff, 348(39.2%) were able to afford the scheme and majority of those who can afford the scheme were married 639 (69%) and family size of not more than 4. On the other hand, 596(64.4%) of the respondents with educational status of degree and above were found to afford the scheme.

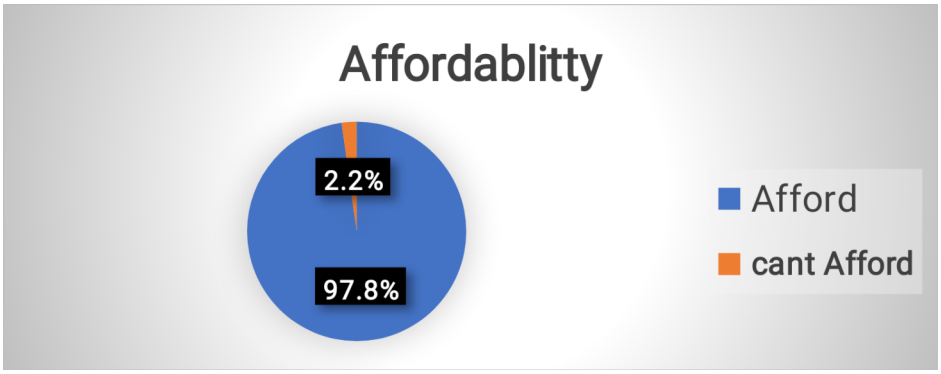

Figure 3 : Affordability of SHI Among Formal Public Servants in Metekel Zone, Benishangul-Gumuz Regional State, 2021, (n=925)

7.4. Factors Associated with Affordability SHI Scheme

Family Size and Educational Level were found to be significant factors associated with Affordability of SHI scheme in multi variable analysis. Respondent with family size of 1-3 were 3.38 times more able to afford the premium as compared to that of family size >=4 (AOR 3.38, 95CI.1.33-8.63). As the result revealed that public servants with educational level of Master & above were two times (50%) able to afford the scheme as compared to those with Degree & Below (AOR 0.52, 95% CI, 0.012-0.0.23).

Variable	Afford		Not Afford	
	Frequency	Percent	Frequency	Percent
Occupation				
	190	20.5	0	0
	218	23.5	1	0.1
	348	39.2	15	1.62
Family size				
<4	487	52.6	1	0.1
>4	418	45.1	9	2.05
Educational status				
Degree & below	236	25.5	3	0.32
Master & above	639	69	6	1.72

Table 5:Affordability and Socio Economic Status of Public Servants in Metekel zone, Benishangul-Gumuz Regional State, 2021

Variables	Category	SHI		COR (95% CI)	AOR(95% CI)	PV
		Not Afford	Afford			
Family Size	1-3	1	487	0.045(0.006-0.339)	3.38(1.33-8.63)***	0.011
	>=3	19	418	1	1	

Educational Level	Degree & below Master & Above	18 2	309 596	1 17.36(4.0-75.2)	1 0.52(0.012-0.23)***	 .000
Sex	Male Female	17 3	560 345	3.49(0.70-1.03) 1	0.174(0.44-0.68) 1	0.056
Religion	Orthodox Muslim Others	5 10 5	590 178 137	0.23(0.56-8.76) 2.03(0.107-1.56) 1	2.1 0.41 1	0.31 0.19
Occupation	Health Facility College Town Administration	1 4 15	218 339 348	1 0.38(0.14-0.19) 0.11(0.86-1.96)	1 0.96(0.85-1.64) 0.19(0.96-1.06)	 0.94 0.98
Work Experience (year)	1-5 5-10 10-15	4 1 15	339 218 348	0.27(0.24-0.81) 0.11(0.02-0.05) 1	0.29(0.98-1.09) 0.51(0.44-4.4) 1	0.29 0.6
Got sick in the last 12 month	Yes No	11 9	369 536	1.77(0.1-0.9) 1	0.3(0.89-1.32) 1	0.32

Table 6 : Determinants of Affordability to SHI Scheme Among Public Servants in Metekel Zone, Benishangul-Gumuz Regional State, 2021,(n-925)

8. Discussion

The current study aims to asses Affordability of the proposed social health insurance and its associated factor in Metekel zone.In this study majority of the public servants (97.8%) of the respondents can afford 3% of their gross salary for social health insurance coverage. The finding was higher than Affordability of SHI among public servants in Arba-Minch town/2019. This could be the difference in the socioeconomic status of the respondents.

From this finding affordability of social health insurance the socio-demographics of the participant. This is in line with one study conducted in Ethiopia. Suggesting that the affordability of social health insurance differs by socio-demographic backgrounds. In this study educational Level and family size were significantly associated with the affordability of the newly proposed SHI scheme. This finding is consistent with study done in America on the uninsured and affordability of health insurance coverage and the study done on Refusal to enroll in Ghana's national health insurance scheme.

Respondents with smaller family size were more able to afford the premium as compared to those with larger family size. This finding was consistently related to the study done in Affordability of SHI among public servants in Arba-Minch town, which revealed that Respondents with family size of 1- 2 were 3 times more able to afford the premium as compared to that of family size >4.The finding is also in line with study done in Ghana, which revealed that the un affords had a mean household size of 5.5, larger than the mean household size of 4.4. As expected, expense of life will increase with increasing of family size and that might interfere with affordability of the scheme.

As result revealed, public servants with educational status of degree and above were more able to afford the scheme. This finding is supported by study conducted in public servants in Arba Minch town, which revealed that educational status of degree and above were 75% more able to afford the scheme as compared to those with certificate and below level and the study done in Dubai .This is mainly because, when educational status of public servants is advancing their carrier as well as monthly income will also improve.

9. Conclusion

The study revealed that Majority of the respondent were able to afford the proposed 3% of gross salary per month contribution as social health insurance scheme premium. Educational Level, family size were factors that significantly interfere with participant's affordability status. Majority of the respondent in this

study found that they have poor knowledge about social health insurance and more than half of the participant in this study have poor Attitude toward the proposed scheme.

Recommendation

Based on the findings, we forward the following recommendations:

For Researchers

For other researcher who had an interest to do their research on this area I recommend to include pensioner and private organization or institution as a part of their research.

For a Federal Minister of Health

As the study indicated that more than half had poor knowledge and Attitude about Social Health insurance. Therefore, there is a need to reinforce information, education, and communication about SHI before the implementation of the scheme through advocacy and awareness creating activities.

For the Government of Ethiopia

Although majority of respondents were able to afford the proposed monthly contribution, but till there are employees who cannot afford. Therefore it is better to think of remedial to enroll those who were not able to afford the insurance scheme like by provision of indigent subsidy.

Limitation

The study did not include Pensioners and private formal servants who are part of the proposed scheme. This study uses 12 12-month recall time for getting sick and the amount of payment for their diagnosis and treatment, and this is prone to recall bias. This study was the first of its kind in our country, and it's difficult to get more references in this area to discuss.

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Moreover, I would want to express my appreciation for the study participants of this research who have devoted their time to provide genuine information to us for our research, and I also thank my data collector for their priceless support.

Funding

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Declaration

I hereby declare that the information given above and in the enclosed document is true to the best of my knowledge and belief, and nothing has been concealed therein. I understand that if the information given by me is proven to be untrue. I will have to face the punishment as per the law

Availability of Data and Materials

The source of the data is present at the corresponding author upon reasonable request by concerned individuals.

Authors' contributions

For this study SAC, BA, DGG and SDB designed, writing result, prepare manuscript for this research. And again highly participated interpretation and analysis of this research finding. All authors approved the final manuscript of this research.

Ethics Approval and Consent

To for this research Ethical clearance was obtained from the Ethical review committee of university of Gondar in Ethiopia. After formal letter written to study area data collection was started and verbal consent was obtained from participants.

Competing Interests

There are no competing interests among author and coauthors.

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