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Original Article

Factors Associated with Households' Awareness of Social Health Insurance in Sundarharaicha Municipality, Morang, Nepal

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Abstract

Background: Out-of-pocket payment for health care is a major challenge in developing countries like Nepal, often leading to financial hardship and delays in treatment, particularly among poor and marginalized populations. To address these challenges, the Government of Nepal implemented the Social Health Insurance (SHI) program. The aim of the program is to improve financial protection and ensure equitable access to quality health services. Despite its potential, limited research has focused on households' awareness of SHI, especially in eastern Nepal.

Objectives: This study aimed to assess awareness of households towards the Social Health Insurance program and identify key socio-demographic and health-related factors associated with it in Sundarharaicha Municipality, Morang, Nepal.

Material and Methods: A cross-sectional study design was employed in three wards of Sundarharaicha Municipality in Morang district, covering households newly enrolled, those who renewed, and those without SHI membership. Primary data was collected from 392 households using a structured questionnaire. Descriptive analysis, chi-square tests, and Firth's penalized binary logistic regression were used to analyze relationships among awareness and socio-demographic variables. Internal consistency of the awareness measures was assessed using Cronbach's alpha.

Results: The majority of respondents (71.7%) revealed high awareness of SHI, with reliable awareness scales (Cronbach's alpha = 0.93). From bivariate analysis, awareness was significantly associated with variables such as ward, gender, age, marital status, family type, ethnicity, religion, and history of chronic disease, source of knowing ($p < 0.05$). Firth's logistic regression identified ward, ethnicity, family health history, and source of information as key determinants of awareness.

Conclusion: This study identified factors associated with household awareness towards social health insurance (SHI). Firth's logistic regression analysis identified ward of residence, ethnicity, family health history, and source of information as the key determinants of awareness.

Keywords: *Awareness, Penalized likelihood, Firth's logistic regression, Cox & Snell, Nagelkerke R^2*

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Introduction

Payment at the health care center is a major challenge in developing countries where income is either low- or middle-level. In such countries, payment for health care is made directly from the pockets. Payment out of pocket can cause financial hardship (Memirie et. al, 2017) and delay in treatment, thereby worsening health problems (Gilson, 1998; Russell, 2004), especially for poor and marginalized groups (Nepal Government Health Insurance Board, 2022; WHO, 2022). To address these challenges, the Government of Nepal established the Social Health Insurance (SHI) program in 2014. But it was formally approved by the Nepalese Parliament in 2015. The SHI program provides financial protection and access to quality health services (Ghimire & Wagle, 2021).

SHI operates on the principles of risk sharing and equity. The financial burden is shared among all members, and everyone has equal and fair access to defined healthcare benefits regardless of their income and social status. All members contribute premiums according to their capacity. The Government of Nepal provides subsidies for those who are unable to afford premiums for their participation in the program. SHI aligns with Universal Health Coverage goals by ensuring that all people receive essential health services without financial hardship (WHO, 2022).

SHI faces challenges in enrollment, retention, and utilization. Thapa et al. (2021) and Bharati et. al (2025) highlighted that households' awareness affects enrollment in SHI. Sharma and Banjara (2020) and Appiah et al. (2012) stated that perception significantly influences enrolment and retention decisions. Awareness measures the knowledge of program benefits, eligibility, and procedures. Socio-demographic and health-related factors, such as age, gender, education, ethnicity, income, family type, and chronic disease status, can affect both awareness as well as program engagement (Dhungana et al., 2021; Acharya et al., 2021).

In Nepal, most research on SHI has focused on enrollment rates, financial benefits, and policy implementation, with limited attention to households' awareness towards SHI. As per our knowledge, very few studies have been conducted on households' awareness of SHI, especially in the eastern region of Nepal. Exploring the relationship between socio-demographic characteristics and awareness of households can help policymakers to develop strategies and reduce misconceptions about SHI. This study aims to assess the awareness of households toward SHI and to identify key socio-demographic and health-related factors associated with awareness.

Methodology

Data

The study was conducted in three wards - 4, 8, and 9 of Sundarharaicha Municipality, located in Morang district, a district in the eastern part of Nepal. The study population consisted of three groups of households during the study period: those newly enrolled in SHI, those who renewed their SHI membership, and those without an SHI membership. The study employed a cross-sectional study design. To ensure the objectives were met, a rigorously designed structural questionnaire, specially developed for this study based on similar studies, was used to collect reliable, unbiased, and accurate data. The study was entirely based on primary data collected from individuals using the personal interview method. At 5% level of significance, the sample size, using the following formula (Cochran, 1997), was determined by

$$\mathrm{n} = \frac{z^2 \times p(1-p)}{e^2} = \frac{1.96^2 \times 0.5 \times (1-0.5)}{0.05^2} = 384$$

where n is the sample size, Z is the Z-score, and e is the margin of error. However, we planned to survey 403 households, considering 5% non-response rate.

Table 1

Population and sample size in each ward

Ward No	Total number of households (Ni)	Total household (N)	Total sample size (n)	Allocated sample size $n_i = \frac{Ni * n}{N}$
4	1449			131
8	1209	4440	403	110
9	1782			162

Table 1 shows the population size and sample size to be selected from each ward. A two-stage sampling technique was used to select a representative sample. In the first stage, three out of twelve wards were selected using simple random sampling. In the second stage, the predetermined sample size was proportionally allocated to each selected ward based on its population size, and households were chosen through systematic sampling (Transect Walk).
Once data collection was completed, a slightly lower non-response of approximately 2.7% was found, resulting in an actual sample size of 392 households.
The variable awareness towards SHI was measured using dichotomous (Yes/No) items, requiring a measure of internal consistency. The internal consistency was evaluated using Cronbach's alpha. The cutoff age for the two age groups – up to 45 years and above 45 years was determined by the median value. Similarly, a small family and a large family were also determined by the median number of members in the family. Median income value was also used to create two groups of respondents for income.

Statistical Analysis

The awareness towards SHI among households residing in the research area is the dependent variable. There are 14 independent variables: ward of residence, age, gender, ethnicity, religion, marital status, occupation, education level of household head, family type (Nuclear or joint family), family size (number of members in a family), monthly income of family, history of chronic Illness (the household head has a chronic disease), family history of chronic Illness (presence of chronic disease in any member of a family), Source of knowing about SHI. Respondents with the disease for one or more years were included as having a chronic illness. If the household's head correctly answered 5 or more 10 SHI questions, they were classified as "High" aware; otherwise, "Low" aware.
In our data, there was complete separation for the "From where come to know about SHI" and quasi-separation for the "Marital status". So, instead of using standard binary logistic regression, Firth's penalized binary logistic regression was used to examine the relationship between a binary dependent variable and one or more independent variables, which can be either categorical or continuous. The model for Firth's penalized binary logistic regression is:

$$\ln\left(\frac{Y=1}{Y=0}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k + \varepsilon$$

where,
Y = Awareness towards SHI
β_i = unknown parameters
X_i = Explanatory variables
ϵ = Random error or noise

Model's performance diagnosis

After fitting the model, model accuracy and fit were assessed using penalized likelihood ratio tests (PLR tests) and the Wald test, as the Hosmer–Lemeshow test is not fully appropriate under penalized regression. Pseudo

R^2 statistics and the Cox & Snell and Nagelkerke R^2 were calculated to quantify the proportion of variations explained by the predictors. In addition, the model's predictive performance was assessed using the Brier score, which captures the mean squared difference between observed outcomes and predicted probabilities.

Statistical Software

All analyses were performed using R Statistical Software (version 4.4.3; R Core Team, 2025).

Results and Discussion

Table 2 presents the frequency and percentage distribution of surveyed households across various categories of demographic and socio-economic variables. The largest proportion (40.82%) of respondents was from ward no. 9, followed by ward no. 4(32.14%) and ward no. 8 (27.04%), which is consistent with the study sampling design. Among the sampled respondents, the majority were male (66.07%), while 33.93% were female. There was only a marginal difference between the percentage of respondents up to 45 years (51.79%) and above 45 years (48.21%). Government/Foreign job-employed respondents were significantly lower in percentage (17.35%) compared to other occupations (82.65%). Brahmin/Chhetri (61.99%) was the leading ethnicity among the others. The majority of the respondents (86.50%) were Hindus.

In the context of education status, most respondents (90.82%) were literate, while only 9.18% were illiterate. Approximately 65% respondents had reported a monthly income of up to Rs. 20,000 (median income value), and the remaining 35% earned more than Rs. 20,000, which shows that the majority of respondents are part of the low-income group. About 95% of the respondents were married, while only 5% were unmarried. Regarding family-type structure, 61.70% were reported living in a joint family, and 38.30% were living in a nuclear family. The majority of respondents (74.50%) lived in small families with five or fewer members, while only 25.6% belonged to larger families.

Most household heads (81.40%) reported that they had no chronic disease, and 78.30% indicated that no chronic disease was present among family members.

More than half of respondents (59.40%) became to know about SHI through health personnel, followed by media (20.20%), and relatives/friends (10.71%), while about 10% respondents had not heard about SHI. A substantial majority (71.70%) of respondents were highly aware of SHI, whereas 28.30% lacked awareness.

Table 2

Frequency distribution of respondents across different demographic and socio-economic profiles

Variables	categories	Frequency	Percentage
Ward No.	4	126	32.14
	8	106	27.04
	9	160	40.82
Gender	Male	259	66.07
	Female	133	33.93
Age	Up to 45 years	203	51.79
	Above 45 years	189	48.21
Occupation	Government/Foreign Employment	68	17.35
	Others	324	82.65
Ethnicity	Brahmin/Chhetri	243	61.99
	Others	149	38.01
Religion	Hinduism	339	86.48
	Others	53	13.52
Education	Illiterate	36	9.18
	Literate	356	90.82

Variables	categories	Frequency	Percentage
Income	Low	254	64.80
	High	138	35.20
Marital status	Unmarried	22	5.61
	Married	370	94.39
Family Type	Joint	242	61.70
	Nuclear	150	38.30
Family Size	Small	292	74.50
	Large	100	25.50
History of chronic disease of the household head	No	319	81.38
	Yes	73	18.62
Family history of chronic disease of the household head	No	307	78.32
	Yes	85	21.68
From where come to know about SHI	Not heard	38	9.69
	Health Personnel	233	59.44
	Media	79	20.15
	Friends/Relatives	42	10.71
Awareness	High	281	71.68
	Low	111	28.32

Table 3 summarizes respondents' awareness of ten statements related to SHI. The findings indicate that general awareness was high, with 90% of respondents reporting that they had heard about health insurance, and 81% reporting awareness of the government's health insurance scheme.

Around two-thirds of respondents reported being financially eligible for SHI (67%), aware of the benefit package of SHI (71%), and about how to use the scheme (67%). Similarly, 69% respondents knew the financial protection against illness offered by SHI. Awareness of the practical aspects, such as knowing where to seek SHI services, was relatively high (82%).

In contrast, the technical details of the scheme were not well understood. Only 54% of respondents were aware of the policy coverage, and less than half (49%) of respondents knew the maximum number of claims allowed per year. Awareness of claim procedures was also moderate (66%).

Table 3

Distribution of respondents' awareness towards ten statements related to SHI

Awareness Items	Yes (1)	No (2)	Proportion (Yes)
Awar_1: Have you ever heard about health insurance?	351	41	0.90
Awar_2: Have you ever heard about the health insurance scheme of the Nepal Government?	318	74	0.81
Awar_3: Are you eligible financially for the health insurance of the Nepal Government?	263	129	0.67
Awar_4: Do you know your benefit package of the Nepal Government health insurance?	277	115	0.71
Awar_5: Do you know how to use your health insurance from the Nepal Government?	263	129	0.67
Awar_6: Do you know about financial protection against illness through health insurance?	272	120	0.69
Awar_7: Do you know the coverage of the policy?	212	180	0.54

Awareness Items	Yes (1)	No (2)	Proportion (Yes)
Awar_8: Do you know where to contact for the health insurance of the Nepalese Government?	321	71	0.82
Awar_9: Do you know how to get a claim on the health insurance of the Nepalese Government?	257	135	0.66
Awar_10: Do you know the maximum number of claims in a year on the insurance of the Nepal Government?	193	199	0.49
Overall Proportion	0.70		

Overall, the mean proportion of "Yes" responses across all ten items was 0.70. This indicates that, on average, seven out of ten respondents were aware of different aspects of SHI. Figure 1, a grouped bar chart, further illustrates the percentage and distribution of respondents' responses to each awareness item of SHI.

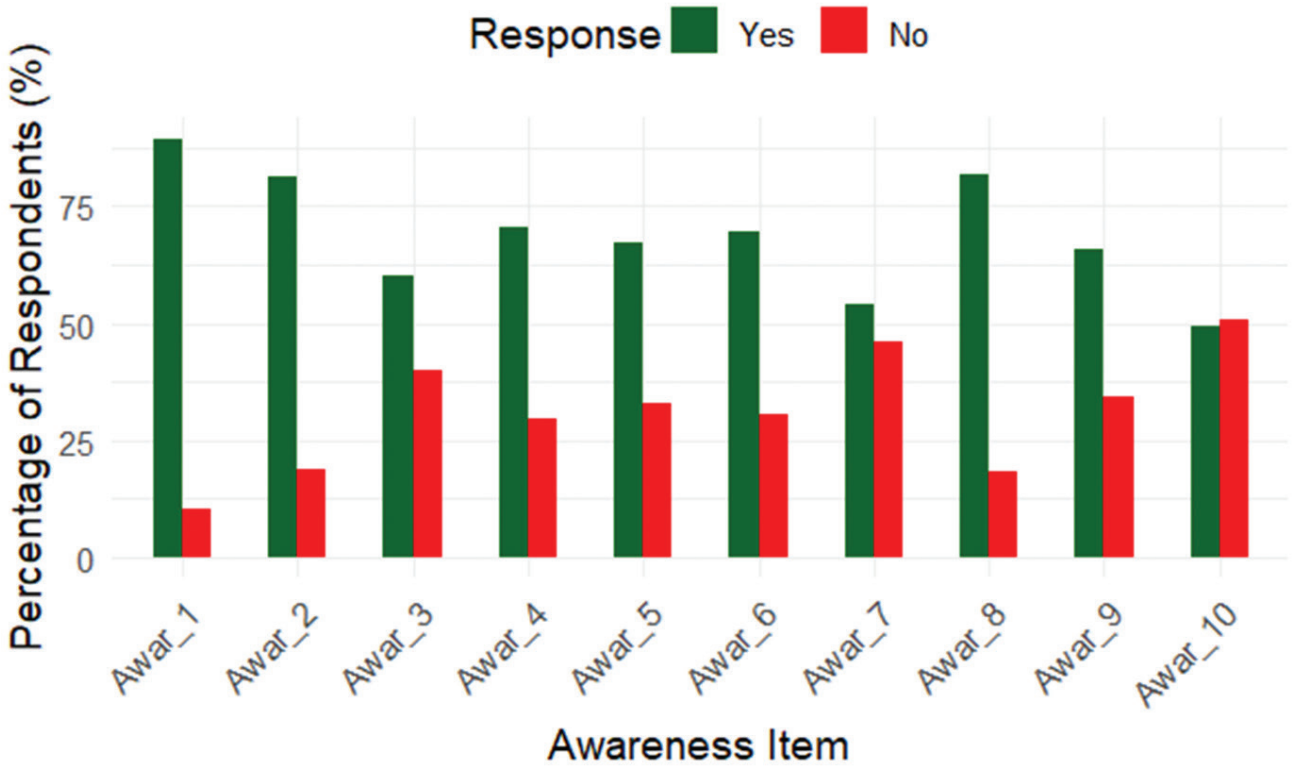

Fig 1: Percentage of responses across awareness items.

In Table 4, to evaluate the internal consistency of the awareness measurement scale, Cronbach's alpha was computed based on the ten awareness items. The analysis presented Cronbach's alpha as 0.93 [95% CI: 0.92-0.94], which is above the commonly accepted minimum of 0.70 (Nunnally & Bernstein, 1994). This result indicates that the items in the scale are consistent in measuring the same underlying construct-awareness towards SHI.

Table 4

Item analysis and internal consistency of the awareness scale toward SHI

Awareness Items	1	2	3	4	5	6	7	8	9	10
Corrected item - Total correlation (r. drop)	0.62	0.65	0.66	0.79	0.83	0.82	0.72	0.75	0.84	0.62

Awareness Items	1	2	3	4	5	6	7	8	9	10
Alpha if Item Dropped (std. alpha)	0.93	0.93	0.93	0.92	0.92	0.92	0.92	0.92	0.92	0.93
Average Inter-Item Correlation	0.59	0.58	0.59	0.56	0.56	0.56	0.58	0.57	0.56	0.60
Signal-to-Noise Ratio (S/N)	13	13	13	12	11	11	12	12	11	13
Item Mean	1.1	1.2	1.4	1.3	1.3	1.3	1.5	1.2	1.3	1.5
Item SD	0.31	0.39	0.49	0.46	0.47	0.46	0.50	0.39	0.48	0.50
Overall Cronbach's alpha = 0.93 [95% CI: 0.92-0.94]										

The value of "alpha if item deleted" suggested that the reliability coefficient remained unchanged (std. alpha = 0.92 - 0.93) when any single item was removed. This result indicates that all ten items substantially contribute to the construct, with no item performing poorly.

The corrected item-total correlations ranged from 0.62 to 0.87, which exceeds the commonly accepted threshold of 0.50 (Field, 2018). This indicates that each item demonstrated strong discriminatory ability and had a high correlation with the overall scale.

The value of average inter-item correlations fluctuated from 0.56 to 0.60. These results are slightly above the recommended range of 0.15 to 0.50 by Clark and Watson (1995). This indicates that the items are moderately related without redundancy.

The high value (11 to 13) of the signal-to-noise ratio (S/N) across all items demonstrates that most of the variance in item responses reflects true score variance rather than noise. These values support the robustness of the measurement scale.

Descriptive statistics of item-level data reveal that item means fluctuated from 1.1 to 1.5 and standard deviations fluctuated between 0.31 and 0.50. This indicates that most respondents answered "Yes" to the awareness items, which suggests a high level of awareness among the participants.

These statistical results indicate that these items represent a reliable scale for measuring respondents' awareness of the social health insurance program.

Table 5

Bivariate analysis of various demographic and socio-economic variables with awareness

Variables	Awareness			Chi-Square	P- value
	Low (111)	High (281)	Total		
Ward No.				37.53	<0.000
8	53 (50%)	53 (50%)	106		
4	33 (26%)	93 (74%)	126		
9	25 (16%)	135 (84%)	160		
Gender				5.428	0.020
Female	48 (36%)	85 (64%)	133		
Male	63 (24%)	196 (76%)	259		
Age Group				4.093	0.043
Up to 45 years	67 (33%)	136 (67%)	203		
Above 45 years	44 (23%)	145 (77%)	189		
Marital Status				5.307	0.021
Unmarried	1 (5%)	21 (95%)	22		
Married	110 (30%)	260 (70%)	370		
Family Type				12.011	<0.000
Nuclear Family	58 (39%)	92 (61%)	150		
Joint Family	53 (22%)	189 (78%)	242		

Variables	Awareness			Chi-Square	P- value
	Low (111)	High (281)	Total		
Occupation				0.442	0.506
Others	89 (27%)	235 (73%)	324		
Government/ Foreign employment	22 (32%)	46 (68%)	68		
Ethnicity				15.98	<0.000
Others	60 (40%)	89 (60%)	149		
Brahmin/Chhetri	51 (21%)	192 (79%)	243		
Religion				6.034	0.014
Others	23 (43%)	30 (57%)	53		
Hinduism	88 (26%)	251 (74%)	339		
Education				1.647	0.199
Illiterate	14 (39%)	22 (61%)	36		
Literate	97 (27%)	259 (73%)	356		
History of chronic disease in the household				6.975	0.008
No	100 (31%)	219 (69%)	319		
Yes	11 (15%)	62 (85%)	73		
Family history of chronic disease in the household				15.708	<0.000
No	102 (33%)	205 (67%)	307		
Yes	9 (11%)	76 (89%)	85		
Family Monthly Income				3.163	0.075
Low	80 (31%)	174 (69%)	254		
High	31 (22%)	107 (78%)	138		
Family Size				0	1
Small	83 (28%)	209 (72%)	292		
Large	28 (28%)	72 (72%)	100		
From where come to know about SHI					<0.000*
Not heard	38 (100%)	0 (0%)	38		
Health Personnel	42 (18%)	191 (82%)	233		
Media	12 (15%)	67 (85%)	79		
Relatives/Friends	19 (45%)	23 (55%)	42		

**Fisher's exact text*

The chi-square test was used to assess the association between awareness status and various variables, as shown in Table 5. Awareness varies significantly according to wards. Respondents of ward no. 9 are more aware (84%) compared to other wards in the study area. Similarly, male respondents (76%) are significantly more aware than female respondents (64%), which aligns with previous findings on health insurance awareness (Dhungana et al., 2021). This indicates that there is a gender gap in awareness towards SHI.

Older respondents, aged above 45 years, show higher awareness (77%) compared to younger respondents, indicating that age is positively associated with awareness. This finding is supported by the previous studies (Dhungana et al., 2021; Thapa et al., 2021). Marital status, found not to be a significant factor for awareness in previous studies (Dhungana et al., 2021; Thapa et al., 2021), was found to be significant in our research. Unmarried respondents (95%) have higher awareness compared to married (70%) ($p = 0.021$); however, the number of unmarried is small ($n = 22$). Additionally, Joint families (78%) are more aware than nuclear families (61%). Respondents belonging to the Brahmin/Chhetri ethnicity were found to have significantly higher awareness (79%)

as compared to others (60%), similar to the findings of the previous study (Dhungana et al., 2021). Moreover, Hindu respondents are more aware compared to other religions. This indicates that religion is associated with awareness, as the chi-square test indicates a significant association (p = 0.014). Households with a chronic disease history or family history have higher awareness than those without, which indicates that direct health experience increases awareness. Awareness is highly dependent on the information source. Health personnel (82.0%) and media (85%) are effective channels for information sources about SHI. However, previous studies (Dhungana et al., 2021; Thapa et al., 2021) found that education and occupation were significant factors; our research did not include these two variables, including family size and monthly income as significant.

Final model

Firth's penalized binary logistic regression was applied to identify the association between awareness and significant factors identified from the bivariate analysis.

Table 6

Odds ratio for the Firth's binary logistic regression model

Coefficients		Beta (□)	SE (□)	OR Exp (□)	95% CI		P-Value
					Lower	Upper	
Constant		-5.866	1.478	0.003	0.000	0.030	<0.000
Ward No.	4	0.938	0.539	2.555	0.873	7.921	0.087
	9	1.267	0.511	3.550	1.263	9.893	0.017
	8®	-	-	-	-	-	-
Gender	Male	0.361	0.298	1.434	0.787	2.597	0.237
	Female®	-	-	-	-	-	-
Age Group	Above 45 Years	0.430	0.304	1.538	0.840	2.859	0.164
	Up to 45 Years®	-	-	-	-	-	-
Marital Status	Unmarried	0.988	0.866	2.685	0.617	25.291	0.211
	Married®	-	-	-	-	-	-
Family Type	Nuclear	0.180	0.422	1.197	0.503	2.806	0.680
	Joint®	-	-	-	-	-	-
Ethnicity	Brahmin/Chhetri	1.023	0.328	2.781	1.447	5.389	0.002
	Others®	-	-	-	-	-	-
Religion	Hinduism	-0.321	0.478	0.726	0.270	1.859	0.509
	Others®	-	-	-	-	-	-
Family history of chronic illness in the household	Yes	1.869	0.629	6.479	1.935	26.544	0.002
	No®	-	-	-	-	-	-
History of chronic disease in the household	Yes	-0.161	0.579	0.851	0.270	2.905	0.789
	No®						
Source of Knowing	Personnel	5.406	1.402	223	27	29211	0.000
	Media	5.347	1.444	210	22	28597	0.000
	Relatives/Friends	4.357	1.409	78	9	10292	0.000
	Not heard®	-	-	-	-	-	-

Table 6 shows that respondents from Ward no. 9 had more than three times higher odds of awareness (OR = 3.550, 95% CI: 1.26 - 9.89, p = 0.017) compared to those from Ward no. 8. Brahmin/Chhetri respondents were approximately three times more aware compared to respondents from other ethnicities. Also, participants with a family history of chronic illness were more aware (OR = 6.48, 95% CI: 1.94 - 26.54, p = 0.002). Furthermore, the source of information about SHI showed a strong influence on awareness. Participants who obtained information from health personnel were 223 times (95% CI: 27 - 29,211, p = 0.000), followed by media 210 times (95% CI:

22 - 28,597, p = 0.001), and by relatives or friends were 78 times (95% CI: 9 -10,292, p = 0.001) more aware compared to those who had not heard about the scheme. Other sociodemographic variables, including gender, age group, marital status, family type, religion, and household history of chronic disease, were not statistically significant predictors at 5% level of significance.

Diagnostics of the fitted model

The penalized likelihood ratio test was $\chi^2 = 157.89$ on 13 degrees of freedom (p = 0.000), and the Wald test was 110.95 on 13 degrees of freedom (p = 0.000). These values confirm that the model was a good fit.

Multicollinearity among predictors was assessed using Variance Inflation Factors (VIFs) from a standard logistic regression model. The highest adjusted VIF was 1.63 for Ward number. Since all adjusted VIFs were below 2, multicollinearity among the predictors was not a concern.

The Cox & Snell R^2 was 0.332, and the Nagelkerke R^2 was 0.474, indicating that the model shows a moderate to strong fit. The Brier score was 0.122, which reflects a reasonable predictive accuracy of the model.

Ward of residence, family health history, and source of information were identified as the key determinants of awareness from this analysis.

Limitations

The study was limited to three wards of Sundarharaicha Municipality in Morang district, which may not be representative of the entire district or Nepal. Thus, the generalization of the findings is limited. Awareness was measured using structured dichotomous (Yes/No) items; although Cronbach's alpha indicated good internal consistency, the scale may not fully capture the full depth of respondents' attitudes and knowledge. The final Firth's logistic regression model explained only about 7 - 10% of the variance in awareness. This indicates that other important factors may not have been captured in the study.

Conclusion

This study assesses respondents' awareness of social health insurance (SHI). The majority (71.68 %) of the respondents disclosed high awareness. Bivariate analysis identified that ward of residence, age, gender, marital status, family type, ethnicity, religion, history of chronic disease in household, and source of knowing were found as significantly associated with awareness of the respondents towards SHI. Ward of residence, ethnicity, family health history, and source of information were found as the key determinants of awareness using Firth's logistic regression analysis.

Conflict of Interest

The authors declare that they have no conflict of interest.

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