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Research article

Morbidity Patterns and Individual- and Household-Level Determinants of Utilizing Primary Healthcare Services: A Cross-sectional Study of Rural Elderly in Khulna, Bangladesh

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ABSTRACT

The Government of Bangladesh aims to improve healthcare services in response to the United Nations Sustainable Development Goal 3 (SDG 3) calls, but the rural elderly still face several barriers in utilizing primary healthcare (PHC) services. The study aimed to investigate individual- and household-level determinants of utilizing PHC services among rural Bangladeshi elderly. A semi-structured interview schedule was developed for surveys from 481 randomly selected elderly (60 years and above) living in Batiaghata, and Dumiura upazilas of Khulna district. The data collected were analyzed using descriptive and inferential statistics. Morbidity among the elderly was very frequent (41.3%), whereas above half of the participants (57%) reported not utilizing PHC services. Upazila Health Complex was the most utilized PHC facility (69.6%) among elderly who utilized healthcare services in PHC facilities. Results of regression analysis revealed that being aged (over the age of life expectancy) was associated with 1.74 times lower odds of utilizing PHC services than those in their 60s. Being female was found 1.59 times the odds of not utilizing PHC services. Furthermore, knowledge gap about PHC services was found to be a significant predictor of utilizing PHC services among the elderly (AOR= 1.88; 95% CI [1.24-2.86]; *p*= 0.003). Moreover, inability to bear healthcare expenses and lack of confidence in modern medication resulted in 2.22 times and 1.70 times, respectively, the odds of not utilizing PHC services among the elderly. The elderly living in a nuclear family had 1.93 times the odds of significantly lower PHC service utilization. Findings from the study suggested disseminating PHC-related information through campaigns, increasing support from family members, and ensuring financial security through health insurance or allowances for the healthcare of the elderly.

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Introduction

Bangladesh, similar to other populous countries in the world, is undergoing a demographic transition as life expectancy at birth has increased due to a steady decline in crude birth rates, death rates, and fertility rates (Karim et al., 2025; Mao et al., 2022; UN, 2011). According to reports of Bangladesh Bureau of Statistics (BBS), in 2015, the elderly constituted approximately 8% of the country's total population, a figure projected to increase to 11.5 % by 2030 and 21.5 % by 2050 (BBS, 2015, 2022a; Sarker, 2025). Additionally, life expectancy has also increased from 67.7 years in 2010 to 72.4 years in 2022 (BBS, 2022a, 2023). With the growth of age, individuals become vulnerable to several health problems, including visual and auditory impairment, gastrointestinal diseases, rheumatic pain, asthma, and so on, leading to a dramatic increase in demand for healthcare services (Kabir et al., 2013; Sarker, 2021; WHO, 2023a). In last few decades, progress in various health indicators can be noticed, easy access to affordable healthcare services is still in substantial challenge around the world, especially for the elderly living not only in Bangladesh but also in different Low- and Middle-Income countries (LMICs) (Dableh et al., 2024; UN, 2020; WHO, 2015). Although in Bangladesh, most of the elderly live in rural areas, the majority of them are unable to utilize primary healthcare (PHC) services (due to insufficient legal frameworks for aged care and

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healthcare support (Hamiduzzaman et al., 2022a; Uddin et al., 2018).

PHC denotes the first stage of interaction between individuals and the organizational healthcare systems, which provides accessible, integrated, continuous, and individual-focused basic healthcare facilities (WHO, 2023b). The Government of Bangladesh (GOB), as a signatory of Alma-Ata Declaration on PHC in 1978 promises to provide healthcare facilities for all and is currently concerned with the Sustainable Development Goal (SDG 3) target to improve the global health outcomes by 2030 (GoB, 2020; MOHFW, 2011; WHO & UNICEF, 2018). Although the Bangladesh government is working to improve healthcare services to respond to the SDG calls, utilization of PHC services, particularly for rural elderly, still remains unsatisfactory (GoB, 2020; Kabir et al., 2021). Though illness among the elderly is very frequent, but they prefer to seek medication from the village doctor or drug sellers or traditional healers for illness treatment instead of utilizing healthcare services in PHC servic centrers, including upazila health complex (UHC), union sub-centres (USC), and community clinics (CCs) (Hamiduzzaman et al., 2017; Kabir et al., 2021; Rummi et al., 2022; Sarker et al., 2023; WHO, 2015).

Several socioeconomic factors hinder rural elderly's utilization of PHC services, such as lack of physical ability, lack of family interaction, dependency on son, lack of financial support, absence of proper health and medicine facilities, and socioeconomic insecurity (Abdullah et al., 2018; Hossen et al., 2023; Kabir et al., 2020). Aging declines the physical ability of the elderly to utilize PHC services (Hamiduzzaman et al., 2022a; Islam et al., 2022). Furthermore, liilteracy or lack of knowledge regarding PHC services also challenges to utilize healthcare form PHC facilities among the eldrely (Abdullah et al., 2018; Rana et al., 2009; Sarker et al., 2023). Interestingly, it was found that the elderly who had spouse or living with children used to avail PHC services two times more than the elderly who did not have a spouse, or were living alone (Hamiduzzaman et al., 2022b; Hossian et al., 2019). Therefore, the rural elderly, particularly elderly women, experience multifaceted socioeconomic challenges, such as isolation and loneliness, lack of savings and financial assistance, lack of trust in PHC services, a lack of autonomy in healthcare decisions, and competing household financial priorities to utilize PHC services in Bangladesh (Hamiduzzaman et al., 2021a; Hamiduzzaman et al., 2021b; Matthews et al., 2023).

Socioeconomic and cultural or organizational factors or determinants were identified in previous studies (Hamiduzzaman et al., 2022a; Hamiduzzaman et al., 2018; Islam et al., 2022; Kabir et al., 2020; Nipun et al., 2015; Verma & Khanna, 2013); however, individual and household-level determinants were minimally focused. Therefore, most of the studies conducted on the influence of socioeconomic factors on healthcare behavior of the elderly were qualitative in nature and solely conducted on rural elderly women (Hamiduzzaman et al., 2018; Hamiduzzaman et al., 2021b; Hossen & Westhues, 2010, 2011, 2012), while relevant quantitative study on the elderly and their relation to utilizing PHC services are especially essential. So, this current study aimed to find out the prevalence of utilizing PHC services by the elderly and to investigate the individual- and household-level determinants of utilizing PHC services among the elderly in rural Bangladesh. This study provides evidence on the association between the individual- and household-level determinants and utilization of PHC services by the rural elderly, reveals the necessity of improving PHC services for the elderly to achieve SDG3, and informs evidence-based policies to address the individual- and household-level determinants of utilizing PHC services among the elderly, particularly in rural areas of Bangladesh.

Materials and Methods

Research Design

This study followed quantitative research design to investigate the influence of individual- and household-level determinants of utilizing PHC services by the rural elderly, using survey method. This approach facilitated testing the objectives of the study by identifying the relationships among variables through deductive reasoning and statistical analysis (Creswell, 2009; Creswell, 2013). Moreover, grounded on the postpositivist philosophy, the quantitative approach emphasizes objectivity and single reality of the study (Creswell & Plano Clark, 2011). Consequently, this cross-sectional study pursued a quantitative approach to cover a relatively large number of participants based on predefined inclusion criteria of the study.

Study Settings

This cross-sectional study was carried out in Dumuria and Batiaghata upazila of Khulna district, located in the Southwestern region of Bangladesh. At the initial stage, Khulna district was purposively selected due to the researcher's interest and convenience. In the second stage, Batiaghata and Dumuria upazila were randomly selected applying the lottery method from the list of nine upazilas of Khulna district (BBS, 2011, 2022b). Later, among the seven and fourteen unions of Batiaghata and Dumuria upazilas, Jalma union and Gutidia union, respectively, have been randomly selected. Finally, the villages of the mentioned unions have been randomly selected again to conduct this research (**Table 1**). At present, the elderly constitute about 9.28% of the total country's population, and since 2015, the percentage of the elderly in Khulna division has been increasing more rapidly than in other divisions of Bangladesh (BBS, 2015, 2022a, 2022b). It is also anticipated that the percentage of the elderly will be more than 10% higher than in Dhaka division by 2050 (BBS, 2015). Moreover, the percentage of the elderly has increased from 8.1% to 10.43% in Khulna district from 2011 to 2022 (BBS, 2011, 2022b). Therefore, the elderly constitute 11.12% and 12.54% of the total population in rural areas of Batiaghata and Dumuria upazila, and are increasing alarmingly (BBS, 2022b). Though the number of the elderly in these regions is increasing rapidly, their utilization of quality PHC services is in challenge due to their socioeconomic conditions (Faisal, 2025). So, these upazilas were selected considering the geographical location and the number of elderly living here.

Table 1: Study Settings

Upazila	Union	Village(s)
Batiaghata	Jalma	Batiaghata, hatbati, hatalbunia, Hogolbunia, Jharvanga and Kismotfultola
Dumuria	Gutudia	Dhopa Para, Gutudia Moddho Para, Gutudia Purbo Para, Gutudia Paschim Para, Jilardanga and Komolpur
Sampling Procedure: purposive at first stage, and later randomly selected		

***(Source:** BBS, 2022b)*

Sampling and Sample

This study followed a multistage sampling design with purposive selection at the first stage to select survey participants. Khulna District was purposively selected based on researcher interest and convenience. Two upazilas were subsequently selected, followed by one union from each and villages within those unions. Participants were then randomly selected from a locally prepared list of 874 eligible older adults. Certain attributes were specified to identify the households with the elderly in the study areas to facilitate a face-to-face interview, including (a) a household with at least one elderly aged 60 and above years old; (b) he/she must be living in the selected area for at least five consecutive years; (c) with or without spouse, but married at least once; and (d) living with their family members or their own. Based on the criteria mentioned above, a population list of 874 elderly had been prepared for sample selection by conducting door-to-door census. Later, a total of 481 samples (237 from 434 elderly in Batiaghata upazila and 244 from 440 elderly in Dumuria upazila) were randomly selected from the study areas among 874 elderly using the lottery method (Cochran, 1977) (**Supplementary file 1**). The online random number generator was used to assign a serial number to the participants (Random Number Generator, n.d.).

Variables of the Study

The rural elderly's utilization of PHC services is manifested by several sociodemographic and economic factors, including age, gender, marital status, financial status, living arrangements, and social assistance receipt (Abdullah et al., 2018; Banerjee, 2021; Hamiduzzaman et al., 2017; Sarker, 2021; Sarker et al., 2023). So, utilization of PHC services was measured by a dichotomous response – 'Yes = 0' and 'No = 1' – for the question – 'Have you utilized PHC services for any kind of ailment or physical problem in the last 12 months?' This dichotomous response was considered as the dependent variable for this study. Therefore, the exposure variables indicated the elderly's individual- and household-level determinants of utilizing PHC services for their ailment, categorized into two dichotomous responses: 0= Yes and 1 = No, like the dependent variable. **Table 2** represents the exposure variables of the study.

Data Collection

Based on literature (Abdullah et al., 2018; Hamiduzzaman et al., 2023; Hamiduzzaman et al., 2018; Islam et al., 2022; Kabir et al., 2020; Sarker, 2025; Zaidi et al., 2024), a semi-structured interview schedule including both open- and closed-ended items in English was developed (**Supplementary file 2**) to address the research objectives. The schedule was framed using the KoboToolbox tool (KoboToolbox, n.d.; UNHCR, 2016), including the demographic and socioeconomic information of the participants, morbidity patterns, and utilization of PHC services, along with the individual- and household-level determinants influencing their utilization of PHC services. Furthermore, the interview schedule was pre-tested on 44 elderly, five percent of the total population (Bryman, 2012), to assess the clarity, comprehensibility, relevance, and feasibility of the items. This also helped to identify ambiguous or redundant items, refine the wording and sequencing of questions, and minimize potential respondent burden and non-response in the main survey. Feedback obtained during the pre-test was reviewed by the research team, and necessary modifications were made before finalizing the interview schedule for data collection. Additionally, the pre-tested participants were excluded from the survey as they had already been exposed to the study questions during the instrument refinement stage. Ten data enumerators were recruited and trained properly to establish rapport with the respondents by lecturing, practicing and role-playing. The study participants were informed about the survey through the participant information leaflet before the interview with the help of selected local volunteers. Notably, six selected participants, who were eligible for the interview, declined to participate in this study due to discomfort with the questions related to illness, time constraints, hearing dysfunction, and privacy concerns, and the researcher again picked up the six participants from the population list following the lottery technique stated in the sampling and sample section of this manuscript. Informed consent was also taken from the participants prior to the interview (**Supplementary file 3**). Data were collected from September to December 2024, while each survey took approximately 30 minutes to complete.

Data Processing and Analysis

Data were processed by removing illegal codes, reducing logical inconsistencies, dropping improbabilities, and solving ambiguities. Coding was used to classify the data in accordance with its quality, quantity, periodical basis, and then the data was tabulated. After collecting quantitative data, the database from KobToolbox was downloaded in the sheet of Microsoft Excel, and quantitative data analysis software such as the Statistical Package for Social Sciences (SPSS) V25 (IBM, 2017) was used to manage quantitative data. Later, data were analyzed using descriptive (i.e frequency, percentage, average, and standard deviation) and inferential statistics (i.e. chi-square and Binary logistic regression). To develop the regression model, the significant exposure variables found from the chi-square test were considered. Prior to the binary logistic regression analysis, the data were examined for missing observations, multicollinearity diagnosis, sparse categories and model fit. No missing observations were identified, and complete-case analysis was performed. Additionally, Multicollinearity was assessed using variance inflation factor (VIF) and tolerance statistics. The multicollinearity diagnosis,

Table 2: Variables of the Study

Exposure Variables	**Operationalization of the Variables**	**References**
Being aged (over the age of life expectancy)	Refers to the elderly belonging above the average life expectancy of Bangladesh (72.4 years) (BBS 2022a, BBS 2023), which has been categorized following the age distribution in Table 3.	BIDS, 2017; Chhetri et al., 2023; Hamiduzzaman et al., 2021a; Hamiduzzaman et al., 2021b
Gender	Refers to male and female elderly	Bhatta et al., 2022, Hossain et al, 2019
Being illiterate	Denotes having no formal education	Hamiduzzaman et al., 2021a; Hamiduzzaman et al., 2021b
Having no income and having no savings	Indicates having no monthly income and savings	Chhetri et al., 2023; Jabeen et al., 2015
Not having spouse	Those elderly who are widow/widower or divorced or separated	Adhikari et al, 2024; Sarker et al., 2023
Living in a nuclear family	Depicts the elderly living with spouse or unmarried children	Bhatta et al., 2022; Hakmaosa et al., 2017; Hamiduzzaman et al., 2021b
Not getting social assistance	Implies currently not receiving government or other social allowance intended to provide financial support for the elderly	Chhetri et al., 2023; Hamiduzzaman, 2020; Hamiduzzaman et al., 2022a; Hamiduzzaman et al., 2018
Lack of knowledge regarding PHC services	Represents lack adequate knowledge about the availability, types of services, and eligibility of using PHC services available in their area.	Hossen & Westhues, 2011; Hossen & Westhues, 2012
Belief in self-medication	Refers to the notion that illness or health problems can be appropriately managed through self-medication at home without consulting a qualified healthcare provider or visiting a PHC facility.	Hamiduzzaman et al., 2020; Hamiduzzaman et al., 2021b
Fear of treatment	Denotes apprehension regarding medical examination, treatment, medication, or treatment-related adverse effects	Hamiduzzaman et al., 2020; Zaghloul et al., 2005; Zaidi et al., 2024
Shame in treatment	Illustrates feeling of embarrassment, or discomfort associated with discussing health problems, undergoing medical examination, or receiving treatment	Hamiduzzaman et al., 2017; Zaghloul et al., 2005; Zaidi et al., 2024
Self-loathing for treatment	Refers to negative self-directed beliefs, feelings, or judgments such as feeling like a burden for treatment	Hamiduzzaman et al., 2021b; Hossen & Westhues, 2010; Hossen & Westhues, 2012
Lack of autonomy in treatment decisions	Indicates autonomy to make or influence decisions regarding their own healthcare and use of treatment.	Abdullah et al., 2018; Hakmaosa et al., 2017; Hamiduzzaman et al., 2022a
Physical inability to use PHC services	Defines difficulty of using healthcare services in PHC facilities because of limitations in mobility, walking, standing, or performing activities necessary to obtain healthcare	Hamiduzzaman et al., 2017; Hamiduzzaman et al., 2020
Inability to bear healthcare costs	Implies ability to pay healthcare-related expenses, such as consultation, medicines, diagnostic tests, and transportation, without financial assistance from others	Hamiduzzaman et al., 2021a; Hamiduzzaman et al., 2022b; Naz et al., 2021; Nipun et al., 2015
Lack of confidence in treatment	Refers to lack of confidence in the quality, effectiveness, reliability, or responsiveness of PHC services or healthcare providers based on prior service experiences	Hamiduzzaman et al., 2022a; Hamiduzzaman et al., 2022b; Naz et al., 2021
Outcome variable		
Utilized PHC services	Denotes using PHC services for illness during the particular recall period (e.g., the last 12 months) regardless of whether the service was attained by a CC or UHC.	Poudel et al., 2024; Abdullah et al, 2018

Variance Inflation Factor (VIF) (< 5) and tolerance limit (> 0.01) associated with significant at p-value ≤ 0.05, between the dependent variable and other predictors were assessed, and only significant predictors were included in the model (**Supplementary file 4**) (Adewoye et al., 2021; Shrestha, 2020). The frequency distribution of all categorical predictor variables was evaluated for sparse cells prior to conducting regression analysis. There were no variables that needed collapsing, since the remaining categories had enough data for estimation. The overall fit of the final binary logistic regression model was assessed using the Hosmer–Lemeshow goodness-of-fit test ($\chi^{2(8)} = 4.74$, $p = 0.785$) (**Supplementary file 4**). The Hosmer–Lemeshow goodness-of-fit test was not statistically significant ($p > 0.05$) indicating as evidence of good calibration/model fit (Boussiala, 2022; Dreiseitl & Osl, 2012; Lemeshow & Hosmer, 1982). Findings were shown using the odds ratio (OR) and the adjusted odds ratio (AOR) with 95% confidence intervals at a 5% level of significance.

Ethical Considerations

The research was performed in accordance with the Declaration of Helsinki, and after finalization of the schedule an application was dropped to Research and Innovation Centre (RIC) of Khulna University, Bangladesh. However, an ethical clearance has been granted by RIC (Reference No. KUECC-24-06-47) before collecting data. In this study, the respondents were provided with information about the purpose of this study. They were kindly invited to take part in the research of their own accord, without any offered incentive. It is important to notify that each interviewee had the freedom to withdraw at any moment of the interview without any coercion.

Results

Demographics of the Respondents

The findings of **Table 3** reveal that most of the participants belonged to the age group of early aging (60 to 69 years old), but the average age of the respondents was above 71 years. A significant portion of the elderly were female (63.8%), and the majority of participants (63.4%) followed the *Sanatan* religion. Furthermore, nearly half of the respondents (47.4%) were illiterate, and the average educational attainment was low (2.73 years of schooling). Alarmingly, more than half of the elderly (57.6%) were not engaged in IGAs, and the average monthly income was minimal (BDT 4,361.85). Moreover, a substantial portion of the participants (above 93%) reported having no savings in a month. Therefore, above 60% of the elderly had a spouse, and most of them lived with their spouse and children (41.2%). Though the majority of the participants (52.4%) did not receive any social type of assistance, the remaining participants (47.6%) received social assistance predominantly from the old-age allowance program of the GoB. Therefore, the average monthly financial benefit they received was only BDT 650, indicating very limited financial aid.

Table 3: Demographics of the Respondents

Demographic Variables	F (%)	Mean & Standard Deviation
Age (in years)		
≤ 69	217 (45.1)	
70-79	157 (32.6)	71.41 & 8.71
≥ 80	107 (22.2)	
Gender		
Male	174 (36.2)	-
Female	307 (63.8)	
Religion		
Islam	176 (36.6)	-
Sanatan	305 (63.4)	
Year of schooling		
Illiterate	228 (47.4)	
Primary level	190 (39.5)	2.73 & 4.01
Secondary level and above	63 (13.1)	
Occupation		
Not involved in any IGA	277 (57.6)	-
Farmer	118 (24.5)	
Day laborer	86 (17.9)	
Monthly income (in BDT)		
No income	126 (26.2)	
≤ 8000	246 (51.1)	4361.85 & 6372.29
≥ 8001	109 (22.7)	
Monthly savings (in BDT)		
No savings	451 (93.8)	
≤ 1500	17 (3.5)	191.28 & 1186.62
≥1501	13 (2.7)	
Marital status		
Married	300 (62.4)	-
Widow/widower/ divorced/separated	181 (37.6)	
Living arrangement		
Alone	17 (3.5)	
With spouse only	70 (14.6)	
With children	139 (28.9)	-
With spouses and children	198 (41.2)	
With grandchildren	57 (11.9)	
Getting social assistance		
No	252(52.4)	-
Yes	229 (47.6)	
Type of assistance		
Widow allowance	40 (17.5)	
Old age allowance	181 (79.0)	-
Others (Disabilities allowance, freedom fighter allowance, NGO allowance)	8 (3.5)	
Amount of monthly assistance (in BDT)		

Demographic Variables	F (%)	Mean & Standard Deviation
≤ 550	27 (11.8)	
551 to 600	194 (84.7)	650.13 & 1008.49
≥ 601	08 (3.5)	

Note: F= Frequency

***(Source:** Field survey, 2024)*

Morbidity Patterns and Utilization of PHC services by the Elderly

Table 4 highlights that about 42% of the elderly experienced frequent illness during past 12 months. The most common illnesses suffered by the elderly were physical weakness (49.7%), physical pain (49.3%), and arthritis (43.5%). Additionally, chronic illnesses such as diabetes (23.9%), cardiac diseases (21.0%), and asthma (20.4%) were also prevalent among the participants. Despite frequently suffering from illness, only 43.0% reported visiting the PHC centre in the last year. The elderly mostly utilized UHC (69.6%), while only 30.4% utilized healthcare services from CCs. The average cost of treatment over the past year was above BDT 15,000, while health expenses were primarily carried out by their children (54.3%).

Table 4: Morbidity Patterns and Utilization of PHC services by the Elderly

Variable	F (%)
Frequency of suffering from illness (in last 12 months)	
Seldom (once a month)	82 (17.0)
Occasionally	139 (28.9)
Frequently	199 (41.3)
Very frequently	61 (12.7)
Type of illness suffered by the elderly (in last 12 months) (Multiple responses)	
Hypertension/Blood pressure	163 (33.9)
Diarrhea	163 (33.9)
Physical pain	237 (49.3)
Cardiac diseases/heart diseases	101 (21.0)
Physical weakness	239 (49.7)
Asthma	98 (20.4)
Diabetes	115 (23.9)
Flu/ Cough	157 (32.6)
Arthritis	209 (43.5)
Eye-related problems	132 (27.4)
Fever	192 (39.9)
Utilized PHC services (in last 12 months)	
Yes	207 (43.0)
No	274 (57.0)
Type of PHC service utilization center (in last 12 months)	
Community clinics	63 (30.4)
Upazila health complex	144 (69.6)
Cost of the treatment (in last 12 months)	
≤10000	234 (48.6)
10001 to 20000	155 (32.2)
≥ 20001	92 (19.1)
Mean & Standard Deviation	15577.23 & 19720.56
Cost bearer of the health care expenses	
Self	150 (31.2)
Spouse	30 (6.2)
Son/daughter	261 (54.3)
Grandson	40 (8.3)

Note: F= Frequency

***(Source:** Field survey, 2024)*

Individual- and Household-level Determinants of Utilizing PHC Services by the Rural Elderly

Descriptive Analysis

Table 5 illustrates that about 63% of the respondents were not over the life expectancy age, whereas almost half of the elderly (47.4%) were illiterate. Furthermore, most of the participants were female, as described in **Table 3**. Additionally, 26.2% of the elderly did not have any monthly income, and consequently, a major portion of the participants had no savings per month. Therefore, over 60% of the participants had spouses, and over half of the participants did not get any social assistance. Furthermore, most participants (52%) had a knowledge gap regarding PHC services, while more than two-thirds of the elderly (68.4%) believed that child health and maternity health were given more importance in PHC centres than they actually were. The highest portion of the respondents (76.7%) feared the process of treatment, and

approximately 80% of them felt shy to disclose their illness. Notably, more than half of the participants (52%) reported physical inability to access PHC services alone, along with most of them (61.1%) not having the ability to bear the healthcare expenses by themselves. Therefore, the elderly expressed less trust in the PHC facilities, and more than 61% of the elderly disclosed lack of reliance on the PHC services.

Table 5 further illustrates the relationship between individual- and household-level determinants and utilization of PHC services among the rural elderly. Findings of the chi-square test revealed that being aged (over the age of life expectancy) was significantly associated with utilizing PHC services (χ^2= 4.12, p= 0.036, φ= 0.10). The results also highlighted that gender of the elderly significantly varies marginally with the utilization of PHC services, but the effect size was small (χ^2 = 3.84, p = 0.050, φ = 0.08). Furthermore, this study reported that being illiterate also had a significant relationship with utilizing PHC services among the elderly (χ^2 = 7.78, p = 0.005, φ = 0.13). Moreover, several economic factors, such as lack of income per month, lack of monthly savings, and not getting any social assistance, also had a statistically significant association with utilizing PHC services by the elderly. This study also found a highly significant relationship between a lack of knowledge and the elderly's utilization of PHC services (χ^2 = 21.94, p= < 0.001, φ = 0.21). Similarly, belief in home medication, lack of autonomy in making healthcare decisions, and inability to use PHC facilities due to physical limitations were significantly associated with reduced utilization of PHC services among the rural elderly. Financial incapacity to bear healthcare expenses also showed a significant relationship (χ^2= 4.74, p= 0.029, φ = 0.19) with utilization of PHC services among the elderly. However, this study did not find any significant differences between perceived negligence in PHC centres, fear of treatment, shame in treatment, and lack of confidence in treatment with utilization of PHC services.

Table 5: Individual- and Household-Level Determinants and Their Association with Utilizing PHC Services

Variables	F (%)	Utilized PHC Services		χ^2	*p*-value	Effect Size
		Yes (%)	No (%)			
Being aged (over the age of life expectancy)						
Yes	179 (37.2)	66 (31.9)	113 (41.2)	4.12	**0.036****	0.10
No	302 (62.8)	141 (68.1)	161 (58.8)			
Gender						
Male	174 (36.2)	85 (41.1)	89 (32.5)	3.84	**0.050****	0.08
Female	307 (63.8)	122 (58.9)	185 (67.5)			
Being illiterate						
Yes	228 (47.4)	83 (40.1)	145 (52.9)	7.78	**0.005*****	0.13
No	253 (52.6)	124 (59.9)	129 (47.1)			
Having no monthly income						
Yes	126 (26.2)	59 (28.5)	67 (24.5)	3.94	**0.047****	0.09
No	355 (73.8)	148 (71.5)	207 (75.5)			
Having no monthly savings						
Yes	451 (93.8)	202 (97.6)	249 (90.9)	9.08	**0.003*****	0.14
No	30 (6.2)	05 (2.4)	25 (9.1)			
Not having spouse						
Yes	181 (37.6)	78 (37.7)	103 (37.6)	4.81	**0.028****	0.11
No	300 (62.4)	129 (62.3)	171 (62.4)			
Living in a nuclear family						
Yes	139 (28.9)	69 (33.3)	70 (25.5)	3.98	**0.046****	0.09
No	342 (71.1)	138 (66.7)	204 (74.5)			
Not getting social assistance						
Yes	252 (52.4)	118 (57.0)	134 (49.9)	4.10	**0.043****	0.09
No	229 (47.6)	89 (43.0)	140 (51.1)			
Lack of knowledge regarding PHC services						
Yes	250 (52.0)	133 (64.3)	117 (42.7)	21.94	**<0.001*****	0.21
No	231 (48.0)	74 (35.7)	157 (57.3)			
Perceived lack of importance to the elderly in PHC centres						
Yes	329 (68.4)	142 (68.6)	187 (68.2)	0.07	0.935	0.04
No	152 (31.6)	65 (31.4)	87 (31.8)			
Belief in self-medication						
Yes	251 (52.2)	122 (58.9)	129 (47.1)	6.64	**0.010*****	0.18
No	230 (47.8)	85 (41.1)	145 (52.9)			
Fear of treatment						
Yes	369 (76.7)	162 (78.3)	207 (75.5)	0.47	0.486	0.03
No	112 (23.3)	45 (21.7)	67 (24.5)			
Shame in treatment						

Variables	F (%)	Utilized PHC Services		χ^2	*p*-value	Effect Size
		Yes (%)	No (%)			
Yes	384 (79.8)	166 (79.8)	218 (79.6)	0.29	0.864	0.01
No	97 (20.2)	41 (19.8)	56 (20.4)			
Self-loathing for treatment						
Yes	306 (63.6)	123 (59.4)	183 (66.8)	3.87	**0.049****	0.09
No	175 (36.4)	84 (40.6)	91 (33.2)			
Lack of autonomy in treatment decisions						
Yes	280 (58.2)	122 (58.9)	158 (57.7)	4.08	**0.043****	0.09
No	201 (41.8)	85 (41.1)	116 (42.3)			
Physical inability to use PHC services						
Yes	250 (52.0)	121 (58.5)	129 (51.6)	6.11	**0.013****	0.11
No	231 (48.0)	86 (41.5)	145 (52.9)			
Inability to bear healthcare costs						
Yes	294 (61.1)	115 (55.6)	179 (65.3)	4.74	**0.029****	0.19
No	187 (38.9)	92 (49.2)	95 (50.8)			
Lack of confidence in treatment						
Yes	297 (61.7)	137 (66.2)	160 (58.4)	3.93	**0.048****	0.09
No	184 (38.3)	70 (33.8)	114 (41.6)			

Note. F= Frequency, χ^2 = Pearson's chi-square; Phi (φ); **Significant at p-value ≤ 0.05; ***Significant at p-value ≤ 0.01

(***Source:*** *Field survey, 2024)*

Regression Analysis

Table 6 presents the individual- and household-level determinants, and their unadjusted, along with the adjusted, effects on utilizing PHC services by the rural elderly. Based on the results of **Table 5**, the multicollinearity diagnosis was conducted (**Supplementary file 4**), and two variables, including belief in self-medication and feelings of self-loathing, were not found to be significant and were excluded from developing the regression model. This table discloses that age, educational status, monthly income, monthly savings, knowledge gap in PHC services, physical inability to use PHC services, inability to bear the healthcare cost, and lack of confidence in PHC services were the key predictors of rural elders' utilization of PHC services. Results revealed that being aged (over the age of life expectancy) decreased the likelihood of utilizing healthcare services compared with those in their sixties (AOR = 1.74; 95% CI [1.10 to 2.75]; *p*= 0.018). It was also highlighted that being female reported 1.59 times lower the odds of utilizing PHC services. Similarly, the elderly facing financial instability experienced 1.64 times the odds of not utilizing PHC services. In the unadjusted model, no significant association was found between the elderly's living arrangement in a nuclear family, but it was found statistically significant as a predictor in the Adjusted model (AOR=1.93, *p*=0.018). Additionally, knowledge gap about PHC services had lower the odds of utilizing PHC services among the elderly (AOR = 1.88, 95% CI [1.24, 2.86], *p*= 0.003). Physical inability represented 2.61 times the odds of not utilizing PHC services (AOR = 2.61, 95% CI [1.49, 4.56], *p*= <0.001). Furthermore, the inability to bear healthcare expenses and lack of confidence in treatment resulted in 2.22 times and 1.70 times, respectively, lower odds of utilizing PHC services among rural elderly. On the other hand, not having spouse, not getting social assistance, and lack of autonomy in treatment decisions were not significantly associated with rural elders' PHC service utilization.

Table 6: Individual- and Household-Level Determinants and Unadjusted (Crude Odds Ratios) Adjusted Odds Ratios (AORs) for Utilizing PHC Services by the Rural Elderly

Variables	Crude Odds Ratio					Adjusted Odds Ratio				
	B (SE)	Sig.	COR	95% CI for COR		B(SE)	Sig.	AOR	95% CI for AOR	
				Lower	Upper				Lower	Upper
Being aged (over the age of life expectancy)										
Yes [R]			1.00					1.00		
No	**0.41(0.19)**	**0.036****	**1.50**	**1.03**	**2.19**	**0.55(0.23)**	**0.018****	**1.74**	**1.10**	**2.75**
Gender										
Male [R]			1.00					1.00		
Female	**0.37 (0.19)**	**0.050****	**1.45**	**1.06**	**2.11**	**0.47(0.21)**	**0.029****	**1.59**	**1.05**	**2.42**
Being illiterate										
Yes [R]			1.00					1.00		
No	**0.52(0.18)**	**0.005*****	**1.68**	**1.17**	**2.42**	**0.49 (0.21)**	**0.020****	**1.64**	**1.08**	**2.48**
Having no income										
Yes [R]			1.00					1.00		
No	**0.93(0.20)**	**<0.001*****	**2.52**	**1.71**	**3.73**	**0.58(0.27)**	**0.030****	**1.79**	**1.06**	**3.03**
Having no savings										
Yes [R]			1.00					1.00		
No	**0.63(0.19)**	**0.001*****	**1.88**	**1.30**	**2.72**	**0.78(0.23)**	**<0.001*****	**2.18**	**1.38**	**3.46**
Not having spouse										
Yes [R]			1.00					1.00		

Variables	Crude Odds Ratio					Adjusted Odds Ratio				
	B (SE)	Sig.	COR	95% CI for COR		B(SE)	Sig.	AOR	95% CI for AOR	
				Lower	Upper				Lower	Upper
No	-0.04(0.19)	0.984	0.96	0.69	1.45	-0.38(0.23)	0.092	0.68	0.43	1.07
Living in a nuclear family										
Yes [R]			1.00					1.00		
No	0.38 (0.20)	0.057	1.46	0.99	2.16	**0.66 (0.28)**	**0.018****	**1.93**	**1.11**	**3.34**
Not getting social assistance										
Yes [R]			1.00					1.00		
No	-0.33 (0.19)	0.079	0.73	0.50	1.04	-0.16 (0.22)	0.97	1.01	0.58	1.76
Lack of knowledge regarding PHC services										
Yes [R]			1.00					1.00		
No	**0.88 (0.39)**	**0.024****	**2.41**	**1.12**	**5.18**	**0.63 (0.21)**	**0.003*****	**1.88**	**1.24**	**2.86**
Lack of autonomy in treatment decisions										
Yes [R]			1.00					1.00		
No	0.05 (0.19)	0.779	1.05	0.66	1.37	0.27 (0.26)	0.295	1.32	0.79	2.20
Physical inability to use PHC services										
Yes [R]			1.00					1.00		
No	**0.45 (0.19)**	**0.014****	**1.57**	**1.08**	**2.28**	**0.96 (0.29)**	**<0.001*****	**2.61**	**1.49**	**4.56**
Inability to bear healthcare costs										
Yes [R]			1.00					1.00		
No	**0.41 (0.18)**	**0.030****	**1.51**	**1.04**	**2.18**	**0.80 (0.23)**	**<0.001*****	**2.22**	**1.40**	**3.51**
Lack of confidence in treatment										
Yes [R]			1.00					1.00		
No	**0.74 (0.19)**	**0.002*****	**2.10**	**1.44**	**3.04**	**0.53 (0.20)**	**0.009*****	**1.70**	**1.14**	**2.54**

Note: * Reference category= Yes (utilized PHC services). OR= Odds Ratio; AOR= Adjusted Odds Ratio; CI= Confidence Interval; **Significant at p-value ≤ 0.05; ***Significant at p-value ≤ 0.01

(***Source:*** *Field survey, 2024)*

Discussion

The key individual- and household-level determinants of utilizing PHC services among the rural elderly, identified from this cross-sectional study and compared and contrasted with the previous literature, are discussed below, which are anticipated to be helpful for developing interventions to increase utilization of quality PHC services for the rural elderly and the development of policies in this area. The investigation of individual- and household-level determinants enabled the interpretation of relevant determinants within interconnected exposure variables rather than as isolated individual characteristics to utilizing PHC services among the elderly.

Morbidity Patterns and PHC Services Utilized by the Elderly

From this study, it was found that physical pain or physical weakness was very frequent among the elderly, but this finding contrasted with the results of Jabeen et.al. (2015), as they found that eye problems and hearing problems were very common among older people (Jabeen et al., 2015). Therefore, Jahan et.al. (2022) found that physical weakness was a frequent illness among the elderly living in Bangladesh (Jahan et al., 2022). Moreover, most of the participants (57%) did not utilize PHC services during illness, and about 70% of the participants went to UHC for utilizing PHC services, which represented similar findings with Jabeen et.al. (2015). Therefore, son of the elderly was the prime cost bearer of treatment, which showed similar conclusion with the findings of Jahan et.al. (2022).

Individual-Level Determinants of Utilizing PHC Services by the Rural Elderly

From the findings of binary logistic regression, it was found that aging, as a key individual-level determinant, predominantly reduces the physical ability of rural elderly and restricts their usage of PHC services. Similar findings have been observed in other studies (Banerjee, 2021; Bhatta et al., 2022; Goins et al., 2005; Hall et al., 2014). The reason signifies that, with the growth of age, the physical fitness of the elderly decreases because of frequent suffering of ailments and the incapability of pursuing quality treatment (Banerjee, 2021). As a result, they prefer to utilize PHC services from nearby health practitioners (Chhetri et al., 2023). Additionally, being female was reported as a gender barrier to utilizing PHC services by. Female elderly were more likely to be deprived of utilizing PHC services than their male counterparts due to gender orientation, structural barriers as well as patriarchal influence, and the finding was consistent with other studies conducted in developing countries (Bhatta et al., 2022; Hamiduzzaman et al., 2018; Hossen & Westhues, 2010; Zaidi et al., 2024). Furthermore, this study revealed a significant association between being illiterate and utilizing PHC services, which has similarity with the findings of Srivastava and Gill (2020) and Paul and Verma (2016), where they found that educated elderly were more likely to utilize healthcare services than illiterate elderly (Paul & Verma, 2016; Srivastava & Gill, 2020).

It was also found that knowledge gap regarding PHC services, as a barrier, significantly lowered the odds of utilizing the elderly's' PHC services, which was also found in studies conducted in other South-Asian countries (Das et al., 2023; Naz et al., 2021; Nipun et al., 2015). Additionally, physical inability to use PHC services was also a significant predictor of utilizing PHC services by the rural elderly with the growth of age. However, this finding contrasts with the findings of Praptiningsih et al. (2016) and Huang et al. (2015) as they reported older elderly utilized organizational healthcare services more frequently than their younger counterparts though they suffered from physical inability recurrently (Huang et al., 2015;

Praptiningsih et al., 2016). But this present study is similar to the findings of Jahan et.al. (2022), as they reported that the elderly who did not actively perform their daily activities could not utilize healthcare services properly during their ailment (Jahan et al., 2022).

Another key individual-level barrier highlighted in this study was financial insolvency or having no income and savings among the rural elderly, which restricts them from availing quality treatment from PHC facilities. Similarly, it has also been reported that inability to bear healthcare costs lowered the odds of utilizing PHC services by 2.22 times among the elderly. The finding was associated with studies conducted in India which highlighted that in most of the cases the elderly barely could avail their healthcare expenses by themselves, and were dependent on their family members for health costs (Das et al., 2023). Lastly, lack of confidence in treatment at PHC centres was found to be statistically significant predictor of not utilizing PHC services among the elderly. Similarly, previous studies revealed that previous experiences of unpleasant behavior of the healthcare service providers, limited availability of medicines, or perceived lack of possibility to cure illness by modern medicine were the predominant reasons for mistrust and non-reliance on PHC facilities (Hamiduzzaman et al., 2021b; Hossian et al., 2019). Additionally, belief in traditional healers decreased trust in PHC services among the rural elderly in Bangladesh (Hamiduzzaman et al., 2017).

Household-Level Determinants of Utilizing PHC Services by the Rural Elderly

This study did not find any significant relationship between not having a spouse and utilizing PHC services by the rural elderly, but other studies revealed that the elderly who had spouse utilized healthcare services more than their counterparts (Hakmaosa et al., 2017; Rajeev et al., 2023). Rajeev et al. (2023) revealed that elderly having spouse were more likely to utilize PHC services than those without a spouse, and widowed or separated elderly frequently experienced loneliness, lacked emotionally supportive caregivers, and were consequently less inclined to use healthcare services.

A key household-level determinant found in this study was that the elderly living in a nuclear family experienced 1.93 times the odds of not utilizing PHC services compared with those who were living in the extended family. This finding had consistency with other studies, as the nuclear family generates the lack of emotional closeness and widening communication gap with the elderly (Adhikari et al., 2024; Das et al., 2023; Poudel et al., 2024; Rosnu et al., 2022). Though, this study did not find any significant association between receiving social assistance and utilizing PHC services by the rural elderly. But other studies found that not having own income, getting no allowance, and financial insecurity in the family influence the healthcare-seeking behavior of the elderly (Agyemang-Duah et al., 2019; Douthit et al., 2015).

This study did not observe any significant association with lack of autonomy in treatment decisions, and the elderly's PHC service utilization as a key household-level determinant, but several studies conducted in developing countries such as India reported that the elderly lacked the freedom to decide on their healthcare services (Das et al., 2023; Douthit et al., 2015; Jena & Paltasingh, 2024; Rosnu et al., 2022; Zaidi et al., 2024). Das et al. (2023) observed that in most of the cases, healthcare decisions were taken by the family members of the elderly, as they bear the treatment cost of the elderly, and they hardly get the opportunity to select organizational healthcare services (Das et al., 2023). Consequently, it was found that the elderly preferred ritualistic treatment over organizational PHC services due to the reasonable costs and the additional benefits of receiving consultations at their residences (Zaidi et al., 2024).

This study used a cross-sectional design, which may limit the ability to establish a causal relationship between utilized PHC services among the elderly and their individual- and household-level determinants. The problem of recall bias due to age-related memory loss also limited the validity of measuring the frequency of illness and the experience of service utilization. This study was conducted within a limited geographical area, which also limits the generalizability of its findings. Furthermore, the individual- and household- level variables have drawn a very partial results without exploring the interaction of the elderly with family members and its influence on utilizing PHC services among the elderly. So, this study recommends further study on to reveal comprehensive findings on individual- and household-level determinants, incorporating familial barriers to utilizing PHC services of the elderly in rural areas of Bangladesh.

Recommendations

The findings of this study highlighted being aged, family type, lack of physical capability, knowledge gap on PHC services, financial constraints for ailment treatment, and lack of trust in modern medicine as leading individual- and household-level determinants of utilizing PHC services among the elderly in rural areas. The following recommendations have been drawn up based on the findings of the study:

1. **Initiating health literacy programs:** Observing the findings of this study, it is suggested to introduce health literacy initiatives such as culturally appropriate visual presentations or conversation in the local language, distribution of leaflets to caregivers containing information about geriatric illness, along with the availability of services for the elderly by the MOHFW.
2. **Initiating healthcare assistance programs for the elderly:** The Government of India has initiated the *Ayushman Bharat*, a health insurance policy, for individuals aged 60 and above (MOHFW, 2024) and has proved effective in addressing the health needs of the elderly. Initiating such health insurance for the elderly can facilitate their utilization of PHC services without financial burdens in Bangladesh.
3. **Increasing awareness regarding geriatric healthcare:** Increasing awareness about emotional closeness, health needs of the elderly, and the elderly's autonomy to make healthcare decisions among family members in the community to ensure PHC services utilization in time, through proper implementation and

monitoring of 'Bangladesh's Parent's Care Act 2013' (Dana et al., 2024).

4. **Strengthening healthcare utilization confidence:** At the local level, community health workers can play a vital role in assisting the elderly in navigating PHC facilities. Therefore, the study suggests arranging a separate corner for the elderly in PHC centres, or outreach PHC services by the MOHFW.

Conclusions

This cross-sectional study was conducted to investigate the individual- and household-level determinants of utilizing PHC services among rural elderly in Khulna district of Bangladesh. The individual- and household-level determinants, as this study analyzed the association of demographic characteristics, knowledge, perceptions on PHC services, and not utilizing PHC services among the elderly. Findings disclosed that the decline in physical ability to move with the growth of age, financial insolvency, lack of knowledge about PHC services, inability to bear health treatment cost and lack of confidence in treatment of PHC facilities were found as key individual-level determinants to the elderly's utilization of quality PHC services. Additionally, living in a nuclear family appeared as key household level determinant to the elderly's utilization of PHC services in rural areas of Bangladesh. Based on the findings of this study, it is essential to reduce the knowledge gap in PHC services, increase emotional connectivity with family members, raise community awareness through camping or courtyard meetings with community people, and initiate healthcare programs for the elderly to ensure utilization of PHC services among the elderly for appropriate and timely treatment.

Abbreviations

BBS: Bangladesh Bureau of Statistics; CC: Community Clinic; GoB: The Government of Bangladesh; LMICs: Low-and Middle-income Countries; MOHFW: Ministry of Health and Family Welfare; PHC: Primary Healthcare; SDG: Sustainable Development Goal; UHC: Upazila Health Complex; UN: United Nations; USC: Union Sub-enter; VIF: Variable Inflation Factor: WHO: World Health Organization

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Conflict of Interest

The authors declare no conflict of interest.

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Author's Contribution

DC and SC contributed to the research conception and design. DC drafted the manuscript, and it was revised several times by SC. DC and SC contributed to the article and approved the final version for submission. DC, as the corresponding author, accepts all the responsibility for the research paper.

Supplementary Materials

Supplementary File 1: Determination of Sample Size
Supplementary File 2: Interview Schedule
Supplementary File 3: Informed Consent Form
Supplementary File 4: Multicollinearity Diagnosis and Goodness-of-fit Test

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Supplementary Materials

Supplementary File 1: Determination of Sample Size
Cochran's Formula for Sample Size Determination

$$n_0 = \frac{z^2 pq}{e^2}$$

$$= \frac{(1.96)^2 \times o.5\ (1-0.5)}{(0.03)^2}$$

$$= \frac{3.842 \times o.5 \times 0.5}{0.0009}$$

$$= \frac{0.9604}{0.0009}$$

$$= 1067.11$$

Correction for Finite Population

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

$$\frac{1067.11}{1 + \frac{1067.11 - 1}{874}}$$

$$= \frac{1067.11}{1+1.22}$$

$$= \frac{1067.11}{2.22}$$

$$= \mathbf{480.68}$$
$$= 481$$

Where:

n_0 = the sample size

z = z value (e.g. 1.96 for 95% confidence level)

p = Population proportion (0.5 used for sample size needed)

q = 1-p

e = margin of error (e.g., 0.03 = ±3)

n= the new adjusted sample size

N= the population size

Supplementary File 2: Interview Schedule

An Interview schedule on

Access and Use of Primary Healthcare Services of Rural Elders in Bangladesh: An Investigation in Southwestern Region of Bangladesh

[The data, collected in this study, will not be disclosed in any circumstance without the permission of the participants and pseudonyms will be used in this case]

Schedule no.: **Interviewer:** **Date:**

Name of the Upazila:

Name of the Union: **Name of the Village:** **Ward No.:**

	Information/ Questions	Response(s)	Coding
Section A: Socio-demographic Information of the Respondents			
1.	Age		(in years)
2.	Sex		① Male ② Female
3.	Religion		① Islam ② *Sanatan* ③Christianity ④…… (Specify)
4.	Year of schooling		(in years)
5.	Occupation		(Specify)
6.	Income (Monthly)		Excluding any allowance (in BDT)
7.	Savings		(in BDT)
	Marital status		① Married ②Widow/Widower ③ Divorced/Separated ④ Deserted
8.	Age of the spouse		(in years) If alive
9.	Occupation of the spouse		(Specify)
10.	Income of the spouse (Monthly)		(in BDT)
11.	Number of offspring	Daughter: Son:	(Only alive children)
12.	Living arrangement		① Alone ② With spouse only ③ With children ④ With spouse and children ⑤ With grand children ⑥ With relatives ⑦…… (Specify)
13.	Getting social assistance		① No ② Yes
14.	Type of assistance (if yes)		① Old Age Allowance ② Freedom fighter allowance ③ Widow allowance ④ …… (Specify)
15.	Amount of assistance (Monthly)		(Specify)
Section B: Information about Household (HH)			
16.	Head of the household		(Specify)
17.	Sex of HHH		(Specify)
18.	Year of schooling of the HHH		(in years)
19.	Occupation of the HHH		(Specify)
20.	Income of the HHH		(in BDT)
21.	Type of the family		① Nuclear family ② Extended family ③…… (Specify)
22.	Total household income (Monthly)		(in BDT)
23.	Total household expenditure (Monthly)		(in BDT)
24.	Total household savings (Monthly)		(in BDT)
Section C: Health care seeking behavior of the respondents			
25.	Frequency of suffering from illness (in the last 12 months)		① Never ② Seldom ③ Occasionally ④ Frequently ⑤ Very frequently

26.	Type of illness suffered (in the last 12 months)	(Specify) ① ② ③ ④ ⑤ ⑥
27.	Visited PHC centre (in the last 12 months)	① No ② Yes
26.1	Utilized PHC facility (in the last 12 months)	① Community clinic ② Union healthcare centre ③ Upazila health complex ④…… (Specify)
28.	Nature of primary illness treatment	① Self-care ② Traditional ③ Unqualified Allopath ④ Qualified Allopath ⑤ Para professionals ⑥ …… (Specify)
29.	Cost of the treatment (in last six months)	(in BDT)
30.	Cost bearer of the health care expenses	① Self ② Spouse ③ Son ④ Daughter ⑤ Relatives ⑥ …… (Specify)
Section D: Barriers to access and use Primary Health Care (PHC) services		
D.1	**Intrapersonal-level barriers**	
31.	Knowledge regarding PHC health care centres	① No ② Yes
32.	Type of PHC service centre known to the respondent	(Specify)
33.	Preferable PHC service provision centre	① Community clinics (CCs) ② Union sub-centres (USCs)/ Rural Sub-centres (RSCs) ③ Union health & welfare centres (UH&WCs) ④ Upazila health complex (UHC)
34.	Knowledge regarding PHC services provided by the centres	① Do not know ② Known ③ Undecided ④ Well known ⑤ Very well known
35.	Decision making freedom to seek PHC services by self	① No ② Yes
36.	Ability to use the PHC services by self	① No ② Yes
37.	Ability to bear the health care expenditure by self	① No ② Yes
38.	Preference to health care providers	① Skilled professionals ② unskilled professionals ③ Pharmacists ④ Traditional healers ⑤ Self-care
39.	Preference to health care providers	① Skilled professionals ② unskilled professionals ③ Pharmacists ④ Traditional healers ⑤ Self-care
40.	Experiences related with PHC services	① Very unsatisfactory ② Unsatisfactory ③ Neutral ④ Satisfactory

		⑤ Very satisfactory
D.2	**Interpersonal-level barriers**	
41.	Major decision maker of PHC services	(Specify)
42.	Financial decision taken for PHC services	(Specify)
43.	Familial support for PHC services	① No ② Yes
44.	Gender discrimination to select PHC services	① No ② Yes
45.	Familial restriction to seek PHC services	① No ② Yes
46.	Knowledge to use PHC services	① Very unsatisfactory ② Unsatisfactory ③ Neutral ④ Satisfactory ⑤ Very satisfactory
47.	Knowledge regarding services provided by the health care providers	① No ② Yes
D.3	**Institutional-level barriers**	
48.	Infrastructural limitation	
a.	Insufficient hospital beds	
b.	Insufficient diagnostic facilities	
c.	Lack of geriatric health care	① No
d.	Lack of geriatric specialists	② Yes
e.	The number of patients is high	
f.	Poor hygiene management	
g.	Inadequate health care providers	
49.	Attitudes of the health care services providers	① Very unsatisfactory ② Unsatisfactory ③ Neutral ④ Satisfactory ⑤ Very satisfactory
50.	Financial cost for medical care	① Very low ② Low ③ Free of cost ④ High ⑤ Very high
D.4	**Community-level barriers**	
51.	Sociocultural barriers	
a.	Belief in self-medication	
b.	Belief on fate	
c.	Belief on religious chants and healing systems	
d.	Reliance on traditional healers	① No
e.	Reliance on unskilled health care providers	② Yes
f.	Religious restrictions to go outside	
g.	Lack of social mobility	
52.	Preference of traditional healers	① No ② Yes
53.	Geographical barriers	
a.	Distance of the health facility	
b.	Scarcity of transportation	
c.	Loss of communication during monsoon	① No ② Yes
d.	Poor road and transportation facilities	
e.	Frequent natural calamities	
f.	Access health care available nearby	
D.5	**Policy-level barriers**	
54.	Absence of heath care policy for geriatric people	
a.	Absence of specific health policy and programs for elderly	
b.	Absence of health insurance	
c.	Lack of social support	① No ② Yes
d.	Lack of easy access to social support	
e.	Absence of free or low-cost medical treatment policy	
f.	Absence of health care allowance	
55.	Lack of awareness-building programs	① No ② Yes
56.	Absence of Government and NGO collaboration in health policy making	① No ② Yes

Supplementary File 3: Informed Consent Form
Consent for Participation in Research
Project Title: Access and Use of Primary Healthcare Services of Rural Elders: An Investigation in Southwestern Region of Bangladesh
Principle investigator: Dipika Chandra
Serial No. of the participant:
Name of the participant:
Address of the participant:

Consent form

Sl. No.	I consent the following:	Yes	No
1.	My participation is voluntary and I understand that I will not be paid for it. I may aware that I have the right to withdraw and discontinue participation at any time.		
2.	I understand that participation involves being interviewed by the lead researcher/ research assistant and during the interview the required data will be recorded.		
3.	I have been assured that my identity and the information obtained from this interview will not be disclosed and that my confidentiality as a participant in this study will remain secure.		
4.	The information obtained from this interview is strictly open to the researcher involved with this project.		
5.	I understand that reports based on the interview can be published at a later stage but without any information that can lead to personal identification.		
6.	I have read and understood the explanation provided to me. I have had all my questions answered to me satisfaction, and I voluntarily agree to participate in this research project.		

…….	……..
Signature or Fingerprint of the participant	Date
…….	……
Signature of the Interviewer	Date

Supplementary File 4: Multicollinearity Diagnosis and Goodness-of-fit Test
Multicollinearity Diagnosis of the Exposure Variables with the Dependent Variable

Variables	Collinearity Statistics		*p*-value
	VIF	Tolerance	
Being aged (over the age of life expectancy)	1.29	0.77	**0.012**
Gender	1.19	0.86	**0.014**
Being illiterate	1.18	0.84	**0.011**
Having no income	2.77	0.36	**0.001**
Having no savings	1.09	0.92	**< 0.001**
Not having spouse	1.32	0.76	**0.011**
Living in a nuclear family	1.20	0.84	**0.039**
Not getting social assistance	2.05	0.49	**0.001**
Lack of knowledge regarding PHC services	1.11	0.90	**< 0.001**
Belief in self-medication	1.11	0.89	0.057
Self-loathing for treatment	1.14	0.81	0.057
Lack of autonomy in treatment decisions	1.48	0.67	**0.002**
Physical inability to use PHC services	2.06	0.49	**0.044**
Inability to bear healthcare costs	2.30	0.43	**0.041**
Lack of confidence in treatment	1.06	0.95	**0.042**

Note. **PHC=** Primary healthcare service; **VIF**= Variance Inflation Factor; Significant at p-value < 0.05

The Hosmer–Lemeshow Goodness-of-Fit Test

Contingency Table for Hosmer and Lemeshow Test						
		Utilized PHC Services				**Total**
		Yes		No		
		Observed	Expected	Observed	Expected	
Step 1	1	33	35.666	15	12.334	48
	2	33	31.287	15	16.713	48
	3	29	27.455	19	20.545	48
	4	24	24.136	24	23.864	48
	5	21	21.642	27	26.358	48
	6	22	19.347	27	29.653	49
	7	19	16.245	29	31.755	48
	8	9	13.336	38	33.664	47
	9	10	11.182	38	36.818	48
	10	7	6.704	42	42.296	49
Chi-square-4.738,		**df-8,**	**Sig. 0.785**			