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ORIGINAL PAPER

# Loneliness and associated socio-demographic factors among rural older adults in Naogaon district of Bangladesh: a cross-sectional study

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## Abstract

Despite the fact that socio-demographic factors have a significant influence on loneliness, this issue has received limited attention, particularly when it comes to older adults in rural Bangladesh. This study aims to address the question posed in the title, investigating the potential connection between socio-demographic factors and loneliness in older adults. The results reveal that around six out of ten participants reported experiencing loneliness. The study identifies that older adults who are advanced in age, women, widows or widowers, those with lower educational attainment, lacking engagement in paid work, possessing lower economic status, living alone, and experiencing poor health are at an elevated risk of loneliness. This study employed a mixed-method approach. A cross-sectional survey was conducted targeting individuals aged 60 and above in the rural Naogaon district of Bangladesh for quantitative data and in-depth interviews (IDIs) and key informant interviews (KIIs) for qualitative insights. Data, encompassing detailed socio-demographic information and loneliness-related details, were collected through a self-administered questionnaire. Binary logistic regression analysis was used to calculate odds ratios for various socio-demographic factors associated with loneliness. In contrast to prior research, this study supports the assertion that socio-demographic factors significantly influence loneliness among older adults. The findings and recommendations from this study are anticipated to guide policymakers in adjusting existing strategies and formulating new ones for the well-being of older adults, aiming to alleviate loneliness.

**Keywords** Loneliness · Socio-demographic · Older adults · Rural · Bangladesh

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## Introduction

The rising number of older adults is becoming a significant worldwide issue, with the percentage of individuals aged 65 and above in the global population expected to rise from 10% in 2022 to 16% by 2050 (United Nations 2023). Over the past ten years in Bangladesh, the older adults have surged by 50.01%, significantly outpacing the overall population growth of 14.66% (Bangladesh Bureau of Statistics 2022). This implies that the growth rate of the older population is 3.41 times higher than the natural increase in the population. In the present circumstances, the ongoing worldwide demographic transition toward an aging population underscores the significance of comprehending the welfare of the older adults. This poses a complex challenge not only for developed nations but also for developing countries such as Bangladesh. The older population is on the rise in an era marked by weakening bonds, a decline in the traditional joint family system, and persistent poverty. These factors collectively contribute to indescribable frustration, alienation, and loneliness, particularly among the older segment of the population.

Older adults face diverse obstacles, including physical and mental health issues, ageism, and financial insecurity, in their daily lives. Among these complications, loneliness emerges as the most prevalent complexity experienced by them globally (Wu 2020). Evidence shows that older adults face an increased vulnerability to experiencing feelings of loneliness (e.g., Courtin and Knapp 2017; Hwang et al. 2020). Typically, loneliness pertains to how people assess their overall extent of social engagement. Yet, according to the commonly accepted definition by Perlman and Peplau (1982), it is a negative emotion stemming from the perception that an individual's social requirements are not aligned, either in quantity or quality, with their existing social connections (Peplau and Perlman 1982). Loneliness plays a significant role in causing human distress, particularly in the older section of the population, where the prevalence rates may be more pronounced (Ekwall et al. 2005). Loneliness is a negative emotional reaction marked by subjective sentiments that can be experienced by individuals of any age. However, it tends to be more common among older adults because of factors such as a higher occurrence of chronic illnesses, diminishing physical capabilities, the loss of a spouse or significant others, and retirement (Cohen-Mansfield et al. 2016; Ong et al. 2016). An expanding body of research has increasingly highlighted the adverse effects of loneliness on individuals' health (Cudjoe et al. 2020; Menec et al. 2020; Paul et al. 2021), personal connections (DiJulio et al. 2018), and overall well-being (DiJulio et al. 2018; Poscia et al. 2018). Furthermore, there was a positive correlation between loneliness and falls (Hsueh et al. 2019), while a negative correlation was observed with the quality of life (Gerino et al. 2017). Although anyone in the population may experience feelings of loneliness (DiJulio et al. 2018), the effects are deemed particularly intense for older adults (Shiovitz-Ezra et al. 2018).

As a nation in Asia, Bangladesh boasts an extensive cultural and religious heritage centered on the support and respect for the older population. Traditionally, families and communities have been responsible for looking after their senior members. Nevertheless, the swift transformations in socioeconomic and demographic aspects, widespread poverty, evolving social and religious norms, the impact of Western cul-

ture, and various other factors have significantly disrupted the conventional system of intergenerational and community-based care. Consequently, the well-being of an expanding older population is becoming increasingly compromised (Rahman et al. 2010). Loneliness, a multifaceted phenomenon, is perceived in various ways by individuals across different circumstances. The literature emphasizes socio-demographic variables as significant factors linked to loneliness (Pinquart 2003; Savikko et al. 2005; Kamiya et al. 2013; Cohen-Mansfield et al. 2016; Solmi et al. 2020). Research examining the impact of socio-demographic factors on loneliness among rural older adults is predominantly focused on developed nations, with limited attention given to this relationship in the context of Bangladesh. The connection between socio-demographic factors and loneliness, particularly in rural older adults in Bangladesh, remains underexplored. Given these gaps in knowledge, it is essential to investigate the extent to which socio-demographic characteristics contribute to the loneliness experienced by rural older adults. Therefore, this study aims to offer a comprehensive understanding of how socio-demographic factors influence loneliness among older adults in the rural Naogaon district of Bangladesh.

## Methods

### Data

The study was conducted using information obtained from individuals aged 60 years and above from the rural areas of Manda Upazila of Naogaon district, typically situated in the northern part of Bangladesh. The data collection period spanned from September 25, 2023, to November 5, 2023. Employing a confidence level of 95% (Z = 1.96) and assuming a prevalence of 50% among the older adults ($p = 0.50$), while considering a margin of error of 5% (i.e., e = 0.05), the formula for determining the sample size is outlined as follows:

$$n = \frac{Z^2\, p\,(1-p)}{e^2}$$

Utilizing the mentioned formula revealed that a minimum sample size of 384 was necessary. However, in order to address potential issues related to selection bias and non-response, this research considered a 5% non-response rate. The final overall sample size was calculated using the following formula:

$$n^* = \frac{n}{Response\ rate}$$

$$= \frac{384}{1 - 0.05}$$

Finally, the study encompassed a total sample size of 404 respondents, achieved through the utilization of a multi-stage sampling approach. Initially, Tentulia Union

within Manda Upazila was selected, followed by the random sampling of five specific wards (Ward 1, 2, 5, 6, and 9). Through probability proportion to size (PPS) sampling, data were then collected from 404 older adults residing in these selected wards. The Union Parishad provided the total count of individuals aged 60 years and above in the chosen areas based on voter lists. The distribution of the interviewed older adults was as follows: 78 from 236 in Ward 1, 57 from 176 in Ward 2, 74 from 228 in Ward 5, 101 from 308 in Ward 6, and 94 from 289 in Ward 9. A well-structured questionnaire in the Bangla language (the national language of Bangladesh), encompassing socio-demographic aspects such as age, sex, education, occupation, monthly income, family size, living arrangements, etc. was administered face-to-face to the 404 older adults by well-trained interviewers. Additionally, data were enriched through six in-depth interviews (IDIs) involving local senior citizens, retired teachers, caregivers to older adults, and local social workers, as well as eight key informant interviews (KIIs) featuring the director/manager of an old home, a representative from the local government office, a government social service officer, and teachers. A separate check (also in the Bangla language) list was prepared to collect data from IDIs and KIIs. Prior to the survey commencement, respondents were presented with the approval declaration, and their verbal consent was sought.

### Outcome variable

Loneliness of older adults is the main outcome variable of this study. This research utilizes The University of California, Los Angeles Loneliness Scale item-3 i.e. 3-item UCLA Loneliness Scale (Hughes et al. 2004). The scale comprises questions such as "How frequently do you experience a lack of companionship?"; "How often do you perceive being excluded?" and "How frequently do you feel left out from others?" Participants are expected to indicate their answers for each item using a 3-point scale (1 = hardly ever; 2 = some of the time; 3 = often). The combined scores for each question can be added together, resulting in a potential score range of 3 to 9. A greater score indicates an increased probability of feeling lonely. During the analysis, binary variables were generated by classifying individuals as either "not lonely" with scores between 3 and 5, or "lonely" with scores between 6 and 9, in accordance with findings from a prior study (Steptoe et al. 2013).

### Explanatory variables

The present study incorporated various socio-demographic factors that previous research has identified as linked to loneliness (Pinquart 2003; Savikko et al. 2005; Kamiya et al. 2013; Cohen-Mansfield et al. 2016; Solmi et al. 2020). Socio-demographic features encompass respondent's current age (grouped as 60–69, 70–79 or ≥ 80 years); sex (classified as male or female), religion (categorized as Islam or Hindu); marital status (classified as married or widow/widower); education(categorized as no formal education, 1 to 5 years of schooling as primary, or 6 to above years of schooling as secondary and higher), occupation (categorized as not involved in any work, involved in paid work or housewife); respondents' monthly income (no income, ≤ 3000 Bangladesh currency Taka [BDT], or > 3000 BDT); family's monthly income

(<5000 BDT, 5000–9999 BDT, or ≥10000 BDT); status of economic dependency (independent, partially dependent, or fully dependent); family size (1–4 or ≥5) and living arrangement (alone, only with spouse, with children, or with others) and health status (healthy, fairly healthy, or unhealthy).

### Statistical analysis

This study adopts a mixed-methods approach, incorporating both quantitative and qualitative analyses. In the quantitative phase, descriptive statistics were initially examined for the study sample, followed by the use of chi-square tests to identify variations in loneliness percentages based on previously mentioned explanatory variables. Multicollinearity in logistic regression analysis was assessed by scrutinizing standard errors associated with regression coefficients. Detection of numerical issues, such as multicollinearity (defined by standard errors exceeding 2.0), was conducted as per Chan (2004); however, no evidence of multicollinearity was found in this study. Subsequently, a binary logistic regression model was applied to elucidate the impact of socio-demographic factors on the determination of loneliness among older adults. All analyses were considered statistically significant at a threshold of $p<0.01$. As the data lacked sampling weights, they were not factored into the analyses. The statistical procedures were executed using SPSS version 16.0 for Windows (SPSS Inc., Chicago, IL, USA). For qualitative data, thematic analysis was employed.

## Ethical considerations

At the beginning of the survey, a commitment was established to maintain the confidentiality of respondent information, assuring that the data would be solely used for research purposes. This commitment was communicated through a consent statement outlining the voluntary nature of participation in the study on loneliness among older adults. Following a thorough understanding of the consent statement, respondents were sought for verbal consent. The decision to avoid obtaining written consent was made to accommodate potential challenges some participants might face in reading and/or writing. The use of thumb impressions, a customary formal practice in activities such as property transfer and voting, was also omitted due to concerns that individuals might not be familiar with its informal application. This precautionary measure was implemented to prevent any hesitancy on the part of respondents to engage in the interview, thereby ensuring the integrity of the data collection process. It is essential to highlight that any personally identifiable information was intentionally excluded from the dataset in this study.

## Results

Table 1 illustrates the socio-demographic characteristics of the study participants. The average age of the participants is 69.6 years. In terms of age distribution, 59.7% fall within the 60–69 years range, 27.7% are aged 70–79 years, and 12.6% are 80

**Table 1** Percentage of the respondents by socio-demographic characteristics and their loneliness status

| Variables | Frequency | Percent | Loneliness status | |
|---|---|---|---|---|
| | | | Lonely | Not lonely |
| Age (in years) | | | | |
| 60–69 | 241 | 59.7 | 162 (67.2) | 79 (32.8) |
| 70–79 | 112 | 27.7 | 68 (60.7) | 44 (39.3) |
| 80 and above | 51 | 12.6 | 36 (70.6) | 15 (29.4) |
| | | | *p*-value=0.360 | |
| Average age | 69.6 | | | |
| Sex | | | | |
| Male | 196 | 48.5 | 119 (60.7) | 77 (39.3) |
| Female | 208 | 51.5 | 147 (70.7) | 61 (29.3) |
| | | | ***p*-value=<0.02** | |
| Religion | | | | |
| Islam | 348 | 86.1 | 235 (67.5) | 113 (32.5) |
| Hindu | 56 | 13.9 | 31 (55.4) | 23 (44.6) |
| | | | ***p*-value=<0.02** | |
| Marital Status | | | | |
| Married | 279 | 69.1 | 178 (63.8) | 101 (36.2) |
| Widow/widower | 125 | 30.9 | 88 (70.4) | 37 (29.6) |
| | | | *p*-value=0.20 | |
| Education Status | | | | |
| No formal education | 168 | 41.6 | 111 (66.1) | 57 (33.9) |
| Primary | 167 | 41.3 | 119 (71.3) | 48 (28.7) |
| Secondary and higher | 69 | 17.1 | 36 (52.2) | 33 (47.8) |
| | | | ***p*-value=<0.01** | |
| Mean years of schooling | 2.5 | | | |
| Occupation | | | | |
| Not involved in any work | 190 | 47.0 | 127 (66.8) | 63 (32.2) |
| Involved in paid work | 130 | 32.2 | 78 (60.0) | 52 (40.0) |
| Housewife | 84 | 20.8 | 61 (72.6) | 23 (27.4) |
| | | | ***p*-value=<0.02** | |
| Respondents' monthly income (BDT) | | | | |
| No income | 43 | 10.6 | 33 (76.7) | 10 (23.3) |
| ≤3000 | 263 | 65.1 | 176 (66.9) | 87 (33.1) |
| >3000 | 98 | 24.3 | 57 (58.2) | 41 (41.8) |
| | | | ***p*-value=<0.08** | |
| Average income | 2774 | | | |
| Family's monthly income (BDT) | | | | |
| <5000 | 104 | 25.7 | 82 (78.8) | 22 (21.2) |
| 5000–9999 | 134 | 33.2 | 97 (72.4) | 37 (27.6) |
| ≥10,000 | 166 | 41.1 | 87 (52.4) | 79 (47.6) |
| | | | ***p*-value=<0.001** | |
| The average Family income | 9482 | | | |
| Status of economic dependency | | | | |
| Independent | 104 | 25.7 | 65 (62.5) | 39 (37.5) |
| Partially dependent | 97 | 24.1 | 63 (64.9) | 34 (35.1) |
| Fully dependent | 203 | 50.2 | 138 (68.0) | 65 (32.0) |
| | | | *p*-value=0.618 | |

**Table 1** (continued)

| Variables | Frequency | Percent | Loneliness status | |
|---|---|---|---|---|
| | | | Lonely | Not lonely |
| Family size | | | | |
| 1–4 | 247 | 61.1 | 164 (66.4) | 83 (33.6) |
| 5 and more | 157 | 38.9 | 102 (65.0) | 55 (35.0) |
| | | | *p*-value = 0.760 | |
| Average family size | 3.8 | | | |
| Living arrangement | | | | |
| Alone | 55 | 13.6 | 40 (72.7) | 15 (27.3) |
| Only with spouse | 116 | 28.7 | 81 (69.8) | 35 (30.2) |
| With children and others | 233 | 57.7 | 145 (62.2) | 88 (37.8) |
| | | | ***p*-value = < 0.001** | |
| Health status | | | | |
| Healthy | 180 | 44.6 | 119 (66.1) | 61 (33.9) |
| Fairly healthy | 131 | 32.4 | 80 (61.1) | 51 (38.9) |
| Unhealthy | 93 | 23.0 | 67 (72.0) | 26 (28.0) |
| | | | *p*-value = 0.23 | |
| Loneliness status | | | | |
| Not lonely | 138 | 34.2 | | |
| Lonely | 266 | 65.8 | | |

*Notes* BDT: Bangladesh currency – Taka; Figures in parentheses indicate percentage; The *p*-values are of chi-square tests; *P*-values < 0.20 are in boldface

years and above. The male participants constitute 48.5%, while the female participants make up 51.5%. The predominant religion among the participants is Islam (86.1%), with 13.9% identifying as Hindu. A significant portion of the respondents (69.1%) is married, while the remaining 30.9% are widows or widowers. Despite observable progress in the educational attainment of the population, the educational status of the study respondents is low, particularly as they have completed their last 60 years of age. The average years of schooling is stand at 2.5, with 41.6% having no formal education, and only 17.1% have surpassed the secondary and higher level of education. The majority of the participants (47%) are not engaged in any work, with 20.1% being housewives. Only 32.2% of the respondents are involved in paid work.

About 10.6% of participants report having no income, while others have received limited old age allowance under the government's social safety net program, resulting in an average monthly income of BDT 2774. In contrast, the average monthly income of the respondents' families is BDT 9,482, with a majority having a monthly income below BDT 10,000. Many older adults experience a decline in physical ability to work, leading to reduced demand in job markets. Consequently, they lack the necessary resources to sustain their livelihoods, making them financially dependent on others. Approximately half of the respondents (50.2%) are fully economically dependent, mostly on family members, while 24.1% are partially dependent, and 25.7% are economically independent. The average family size of the respondents is 3.8, with a majority (61.1%) having a family size of 1–4 members. Living arrangements vary, with 57.7% residing with their children and others, 28.7% living only

with their spouses, and 13.6% living alone. Health status indicates that 44.6% of respondents are healthy, 32.4% are fairly healthy, and 23.0% are deemed unhealthy. It is also observed the majority of the older adults report experiencing lonely (65.8%) while 34.2% report experiencing not lonely (Table 1).

Table 1 also highlights the association between socio-demographic variables and the loneliness experienced by older adults. The data indicates that the percentage of the respondents who report feelings of loneliness is higher among those aged 80 years and above. Females, in particular, exhibit a significantly higher percentage of loneliness compared to their male counterparts ($p < 0.02$). Religious affiliation also plays a role, with respondents identifying as Islam experiencing more loneliness than those identifying as Hindu ($p < 0.02$). Marital status is another factor, with widows/widowers reporting a higher percentage of loneliness compared to their married counterparts. Notably, respondents with higher levels of education tend to experience significantly lower levels of loneliness ($p < 0.01$). Moreover, respondents who are not engaged in any form of work, including housewives, those with no monthly income, individuals with monthly family incomes below BDT 5000, those financially dependent on others, those with a family size of 1–4, individuals living alone, and those in poor health (unhealthy) contain higher percentage of experiencing loneliness compared to their respective counterparts (Table 1).

The relationship of various socio-demographic factors with loneliness becomes evident in the following interview with a key informant. A key informant acting as the manager and caretaker of an old home recounted a poignant tale highlighting the challenges faced by older adults. He shared the narrative of a 65-year-old Hindu woman who once enjoyed a happy family life with her husband, only son, and his family, including two grandchildren. Tragically, her life took a turn when her husband passed away a decade ago, leading to a cardiac arrest that left her hospitalized for 20 days. Since then, she has been grappling with various health issues, including cardiac problems, diabetes, high blood pressure, and eye complications. During this challenging period, the woman noticed a significant shift in her son and daughter-in-law's behavior towards her. Their treatment became noticeably unkind. In a distressing turn of events, her son deceitfully obtained her thumb impression on some documents, falsely claiming it was for starting a new business. Several months later, he callously asked her to vacate the family home, asserting that he now owned the property based on the documents she had unwittingly signed over to him. Devastated and heartbroken, the elderly woman found herself abandoned and cast out from her own home. She often reflects on how having a partner, education, property, and better health might have spared her from such a grim fate. Regretfully, she also wishes she had more children who could have provided support in her time of need. The manager also added that this story echoes the experiences of many older residents in that old home.

Table 2 displays the results of the binary logistic regression model, illustrating the odds associated with not experiencing loneliness across various categories of explanatory variables. The likelihood of experiencing loneliness is higher among respondents aged 80 years and above (odds ratio: 0.85, 95% CI: 0.44–1.65) and lower among those aged 70–79 years (odds ratio: 1.33, 95% CI: 0.83–2.11). Female older adults are significantly more likely to experience loneliness than their male coun-

**Table 2** Socio-demographic factors influencing loneliness among older adults

| Variables | β | SE(β) | Odds ratio | 95% CI |
|---|---|---|---|---|
| Age | | | | |
| 60–69® | - | - | 1.00 | - |
| 70–79 | 0.28 | 0.24 | 1.33 | 0.83–2.11 |
| 80 and above | –0.16 | 0.34 | 0.85 | 0.44–1.65 |
| Sex | | | | |
| Male® | - | - | 1.00 | - |
| Female | –0.44 | 0.21 | 0.64** | 0.24–0.97 |
| Religion | | | | |
| Islam® | - | - | 1.00 | - |
| Hindu | 0.52 | 0.29 | 1.68* | 0.95–2.97 |
| Marital status | | | | |
| Married® | - | - | 1.00 | - |
| Widow/widower | –0.30 | 0.23 | 0.74 | 0.47–1.17 |
| Education status | | | | |
| No formal education® | - | - | 1.00 | - |
| Primary | –0.24 | 0.24 | 0.79** | 0.49–1.25 |
| Secondary and higher | –0.58 | 0.29 | 1.79* | 1.00-3.16 |
| Occupation | | | | |
| Not involved in any work® | - | - | 1.00 | - |
| Involved in paid work | 0.29 | 0.23 | 1.34 | 0.85–2.14 |
| Housewife | –0.27 | 0.29 | 0.76 | 0.43–1.34 |
| Respondents' monthly income (BDT) | | | | |
| No income® | - | - | 1.00 | - |
| ≤3000 | 0.49 | 0.38 | 1.63* | 0.77–3.46 |
| >3000 | 0.86 | 0.41 | 2.37 | 1.05–5.35 |
| Family's monthly income (BDT) | | | | |
| <5000® | - | - | 1.00 | - |
| 5000–9999 | 0.35 | 0.30 | 1.42 | 0.78–2.60 |
| ≥10,000 | 1.21 | 0.29 | 3.39*** | 1.93–5.93 |
| Status of economic dependency | | | | |
| Independent® | - | - | 1.00 | - |
| Partially dependent | –0.11 | 0.29 | 0.90 | 0.51–1.60 |
| Fully dependent | –0.24 | 0.25 | 0.79 | 0.48–1.29 |
| Family size | | | | |
| 1–4® | - | - | 1.00 | - |
| 5 and more | –0.68 | 0.14 | 1.06 | 0.69–1.62 |
| Living arrangement | | | | |
| Alone® | - | - | 1.00 | - |
| Only with spouse | 0.14 | 0.36 | 1.52 | 0.56–2.35 |
| With children and others | 0.48 | 0.33 | 1.62 | 0.85–3.10 |
| Health status | | | | |
| Healthy® | - | - | 1.00 | - |
| Fairly healthy | 0.22 | 0.24 | 1.24 | 0.79–1.99 |
| Unhealthy | –0.28 | 0.28 | 0.76 | 0.44–1.31 |

*Notes BDT* Bangladesh currency – Taka, *β* regression coefficient, *CI* Confidence interval, ® Reference category, *SE* Standard error; Level of significance: ***$p<0.001$; **$p<0.01$; *$p<0.05$

terparts (odds ratio: 0.64, 95% CI: 0.24–0.97). Hindu respondents are more likely to report not feeling lonely than their Islam counterparts (odds ratio: 1.68, 95% CI: 0.95–2.97). In contrast to married respondents, widows/widowers are less inclined to not experience loneliness (odds ratio: 0.74, 95% CI: 0.47–1.17). Respondents with primary education have 0.79 times lower odds (95% CI: 0.49–1.25), while those with secondary and higher education have 1.79 times higher odds (95% CI: 1.00-3.16) of not experiencing loneliness compared to those with no formal education. Paid workers are more inclined (odds ratio: 1.34, 95% CI: 0.85–2.14), whereas housewives are less prone (odds ratio: 0.76, 95% CI: 0.43–1.34) to not experience loneliness compared to the reference category.

Loneliness is also highly influenced by the income of respondents. Those with a monthly income ≤ BDT 3000 and those earning > BDT 3000 are both more likely to report not feeling lonely compared to those with no income. Respondents with a higher economic status, specifically those with a monthly family income ranging from BDT 5000 to 9999 and ≥ BDT 10,000, are more likely to report not feeling lonely compared to those in a lower economic bracket (i.e., monthly family income below BDT 5000). Financial dependence, whether partial (odds ratio: 0.90 and 95% CI: 0.51–1.60) or full (odds ratio: 0.79 and 95% CI: 0.48–1.29), is associated with a lower likelihood of reporting not feeling lonely compared to financial independence. The probability of feeling not lonely is greater (odds ratio: 1.06 and 95% CI: 0.69–1.62) among respondents with a family size of 5 and more compared to the reference category. Additionally, respondents living solely with their spouse and those residing with children and others are 1.52 (0.56–2.35) times and 1.62 (0.85–3.10) times more likely, respectively, to report not feeling lonely compared to those living alone. Unhealthy respondents are less likely to report not feeling lonely than the reference category (odds ratio: 0.76 and 95% CI: 0.44–1.31).

An in-depth interview with an impoverished elderly widow working as a domestic worker highlights the significant influence of socio-demographic factors on elderly loneliness. As an impoverished elderly widow, her experiences demonstrate how age, gender, poverty, social neglect, and family disconnection worsen elderly loneliness. Her late husband's addiction and societal stigma deepened her isolation, while the lack of support from her children reflects broken family ties. As she ages and becomes physically unable to work, her financial insecurity and health issues increase, intensifying her sense of helplessness and abandonment. Her impoverished background limits her access to resources, including healthcare and social support systems, further deepening her feelings of helplessness.

## Discussion

This research aims to comprehensively record various dimensions of socio-demographic factors and the loneliness encountered by older adults residing in rural areas. The investigation delves into the significance of these factors in determining the level of loneliness experienced by older adults. This study represents the introductory exploration shedding light on the impact of socio-demographic variables on the loneliness of older adults in the rural Naogaon district of Bangladesh. The results

of the study reveal that a majority of older adults report feelings of loneliness. The extent of loneliness among older adults is notably influenced by factors such as age, gender, religion, marital status, educational background, occupation, economic status, economic dependence, family size, living arrangements, and health status.

Previous studies suggested that advancing age is linked to heightened feelings of loneliness (Pinquart and Sorensen 2001; Savikko et al. 2005; Zhong et al. 2018), and this association with age follows a U-shaped pattern (Solmi et al. 2020). In line with these findings, the result of this study similarly indicates that the loneliness experienced by older adults is influenced by age, exhibiting a U-shaped pattern in their connections. The statistical analysis revealed that gender emerged as a significant predictor for heightened loneliness levels. The current study observed a higher likelihood of women experiencing loneliness compared to men. Consistent with prior studies (Jylhä 2004; Cohen-Mansfield et al. 2016; Solmi et al. 2020; Srivastava et al. 2021), this study affirms that females are at an elevated risk of loneliness. The relationship between religion and loneliness is evident, as people may turn to religious practices to find comfort and a sense of community when feeling lonely. Research indicates that religious beliefs play a crucial role in providing support for the elderly (Sheikholeslami et al. 2012). This study reveals a noteworthy association between the religious affiliation of participants and their loneliness levels among the older adults. Notably, Hindu respondents are more likely to report not feeling lonely compared to their Muslim counterparts. This disparity may be attributed to a decline in religious activities among Muslim respondents over the years, leading to weaker social bonds compared to Hindus.

Elderly who lack a spouse tend to experience greater loneliness compared to those who are married (Cohen-Mansfield et al. 2016; Phaswana-Mafuya and Peltzer 2017), and the current study aligns with this observation by confirming that older adults without a spouse are more prone to the feelings of loneliness than their married counterparts. In this research, it was discovered that a lower level of education was linked to heightened feelings of loneliness in older adults, aligning with findings from earlier studies (Dahlberg and McKee 2014; Cohen-Mansfield et al. 2016; Hansen and Slagsvold 2016).The findings of this research suggest that older adults who are not engaged in any type of paid work, have minimal or no monthly income, possess lower family income, and are economically reliant on others are more susceptible to experiencing loneliness compared to their counterparts. These results align with existing research, indicating that individuals who are unemployed (Vakili et al. 2017; Srivastava et al. 2021), have lower incomes (Stewart et al. 2009; Zavaleta et al. 2017; Eckhard 2018) and dependent on other (Vijg 2007) are more prone to loneliness than their counterparts. The current research confirmed that having a small household size and living alone increases the risk of experiencing loneliness among respondents. This conclusion aligns with findings from earlier studies (Steed et al. 2007; Tomstad et al. 2017; Vakili et al. 2017; Zhong et al. 2018), reinforcing the significance of these factors in contributing to loneliness among older adults. The finding of this research suggests that older adults in poor health (unhealthy) are more prone to feelings of loneliness compared to their healthier counterparts. This conclusion is consistent with previous studies (Fry and Debats 2002; Victor et al. 2005; Cattan et al. 2011) that have identified poor health as a risk factor to loneliness.

## Conclusion

This study sought to investigate the impact of various socio-demographic factors on the loneliness of older adults in rural areas of Naogaon district, Bangladesh. The research revealed that almost 60% of older adults experience loneliness. Additionally, the study identified that older adults of advanced age, women, widow/widower, those with lower educational attainment, lacking engagement in paid work, having a lower economic status, living alone, and poor health status may be at a heightened risk of loneliness. Today's adults will inevitably become the older generation of the future. Aging is a natural part of life, and if we desire longevity, growing older is a certainty. With the ageing population, there is a growing urgency to formulate strategies that enable both current and future generations of older adults to lead independent lives and enjoy a high quality of life. Drawing from the study's findings, we propose that intervention strategies should focus on some specific areas such as (1) Targeted community support for older adults e.g., Implement targeted support programmes tailored to the needs of older adults, with a special focus on those who are older, female, widowed, living alone, or part of smaller or nuclear family structures; (2) Promoting employment and income e.g., Develop tailored employment programs for older adults in rural areas, leveraging their wealth of knowledge, skills, and experience to improve household income. Providing sufficient income support is crucial in alleviating loneliness among older adults; (3) Dignified care and health services for older adults, e.g., Developing adequate services and facilities is vital to ensure dignified care for older adults. The creation of specialized healthcare centers and social health insurance systems is essential to offer financial protection and make healthcare affordable and accessible for all older adults; (4) Fostering respect for older adults through education and advocacy e.g., Integrating moral and religious teachings promoting respect and responsibility toward older adults into educational institutions and mass media; and (5) Enhancing social capital to alleviate loneliness e.g., Providing social skills training, including effective use of communication tools such as telephone, mobile, or internet platforms the enhancement of social connectedness in reducing older adults loneliness.

This study has several limitations. Firstly, sample size and geographic coverage might not be comprehensive enough to represent the entire country accurately. Secondly, our reliance on self-reported data introduces the possibility of recall or reporting biases. Thirdly, the data were cross-sectional, preventing an examination of causality between certain socio-demographic variables and loneliness. Fourthly, there is an ongoing debate regarding the measurement of loneliness. It is important to acknowledge these constraints in future research efforts. Despite these limitations, the study holds significance as it provides a meaningful analysis of socio-demographic variables in relation to loneliness, contributing to a deeper understanding of their connection, consistent with the findings in existing literature. Future studies on a larger scale are recommended to explore this area, potentially leading to improved and loneliness-free lives for rural older adults.

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**Data availability** Data will be made available on request.

## Declarations

**Ethical approval** Written consent (who can read and write) and verbal consent (who are illiterate) were obtained from the participants before data collection.

**Informed consent** Primary datasets were used in this research. Participation of the respondents was voluntary, and the anonymity was attested to secure data confidentiality and authenticity. The respondents also provided their approval for announcing the interpreted results of this study without their identifiable information.

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**Conflict of interest** The author(s) affirm that there are no possible conflicts of interest regarding the research, authorship, and/or publication of this article.

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