The emerging burden of chronic diseases, disease-stratified exploration and gender-differentiated healthcare utilisation among adult patients in Bangladesh

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Abstract

Background:

Chronic diseases are considered one of the major causes of illness, disability and death worldwide. Chronic illness leads to a huge health and economic burden, especially in low- and middle-income countries. This study examined disease-stratified healthcare utilisation (HCU) in adult Bangladesh patients with chronic diseases from a gender perspective.

Methods:

Data from the nationally representative Household Income and Expenditure Survey 2016-2017 consisting of 12,005 patients with diagnosed chronic diseases was used. Gender differentiated chronic disease stratified-analytical exploration was performed using logistic regression to identify the potential factors for higher or lower utilisation of healthcare services after step-by-step adjusting for independent confounding factors.

Results:

The five most prevalent chronic diseases among patients were gastric/ulcer (Male/Female (M/F):16.77% / 16.40%), arthritis/rheumatism (M/F:13.70% / 13.86%), respiratory diseases/asthma/bronchitis (M/F: 12.09% / 12.55%), chronic heart disease (M/F: 8.30% / 7.41%), and blood pressure (M/F: 8.20% / 8.87%). Eighty-six percent of patients with chronic diseases utilised health care services during the previous 30 days. Although most patients received outpatient healthcare services, a substantial difference in HCU among employed male (53%) and female (8%) patients were observed. Chronic heart disease patients were more likely to utilise health care than other disease types for both genders while the magnitude of HCU was significantly higher in males (OR = 2.22; 95% CI:1.51-3.26) than their female counterparts (OR = 1.44; 1.02-2.04). A similar association was observed among patients with diabetes and respiratory diseases.

Conclusion:

Emerging burden of chronic diseases were observed in Bangladesh. Patients with chronic heart disease utilised more healthcare services than patients experiencing other chronic diseases. The distribution of HCU varied by patient's gender for the empolyment status. Risk-pooling mechanisms and access to free or low-cost healthcare services among the most disadvantaged people might enhance their universal health coverage.

Background

Chronic diseases are the leading causes of death globally [1]. Estimates suggest that chronic diseases cause approximately 41 million deaths annually, equivalent to 71% of all deaths globally [2]. Each year, more than 15 million people die from a chronic disease who are aged between 30 and 69 years; 85% of

these “premature” deaths occur in low- and middle- income countries [2]. The major chronic diseases are ischaemic heart disease, stroke, chronic obstructive pulmonary disease (COPD) and diabetes [3]. Notably, 75% of deaths from chronic diseases are associated with modifiable risk factors (e.g., tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets). The epidemic burden of chronic diseases adversely impacts individuals, communities, and families, resulting in health systems being overwhelmed and incurring socioeconomic costs [2]. Therefore, investing in chronic diseases detection, screening, treatment and palliative care are vital components of an effective response to achieve the 2030 Agenda for Sustainable Development Goal (SDG) 3.4: reducing premature deaths by one-third by 2030 [4].

Bangladesh is a developing country that is undergoing both epidemiologic and demographic transitions, where the disease burden is shifting from an infectious disease dominated disease profile to a highly characterised chronic diseases profile, coupled with socioeconomic inequality and predominantly rural populations [5, 6]. Chronic diseases account for approximately 61% of total burden of disease and 54% of annual mortality in Bangladesh, with diabetes, cardiovascular disease, chronic respiratory disease, cancer and stroke most common to impact health in the future in Bangladesh [7, 8]. The global burden of disease country profile for Bangladesh highlights a trend of increased chronic diseases mortality due to stroke, ischaemic heart disease, COPD and diabetes [9]. Significant challenges such as a private health sector that is highly unregulated and a weak public health system must be addressed in conjunction with the ongoing increase in chronic diseases. With more than 70% of the population residing in rural areas, access to formal healthcare services are minimal and out-of-pocket expenditure is high with minimal health insurance coverage [10, 11]. HCU is often compounded by high treatment costs, limited access to proper care, inadequate or lack of infrastructure, and socioeconomic gaps [6]. Evidence also indicates that households with individuals with one or more chronic diseases face significantly higher financial risks [12, 13].

Adopting a gendered approach to chronic diseases management is imperative, as men and women function biologically different and therefore encounter different health risks, experience different health system responses, and their health-seeking behaviours differ, all impacting their health outcomes as well as HCU [14, 15]. The literature shows that due to lower social status, limited education access, and economic vulnerability, women are disproportionately affected than men in their healthcare [16]. In one study carried out in India, older women reported decreased HCU compared to their male counterpart, resulting worse self-rated health and higher disability prevalence among the older women [17]. A study in Canada conversely found that women utilise healthcare services much more than men and spend more on healthcare [18]. Older women were more likely to utilise outpatient care, as was identified in a study with older participants from China, India, South Africa, Ghana, the Russian Federation and Mexico [19]. In Bangladesh, men are often viewed as the head of households, decision-makers and are usually in charge of household resources and they are more likely to decide on the women’s health needs and where and when they should utilise healthcare services [20]. A more recent Indian study found that women are lagging behind than their male counterparts in utilising inpatient care for chronic diseases such as diabetes, hypertension, chronic lung disease, depression, stroke, and asthma [21]. This study also

identified males were willing to travel greater distances to access better-equipped healthcare facilities than women who tend to sought inpatient care at facilities near their homes. Gender disparities continue to be present in many underdeveloped countries including Bangladesh due to societal attitudes undermining women's health, male decision-making on female health leading to lack of women empowerment, and the prioritisation of men's health [22]. It is important to ensure womens' appropriate HCU to reach the SDG 5: Health and gender equality [23, 24]. However, there is a scanty of information on the existing gender disparities in utilising healthcare services among patients with chronic diseases in Bangladesh. Therefore, this study aimed to examine the gender perspective of HCU among patients with chronic diseases in Bangladesh.

Methods

Study design and sampling

This cross-sectional study used data from a nationally representative survey, the Household Income and Expenditure Survey (HIES) in Bangladesh. The HIES is commonly used worldwide, especially in developing countries, to assess poverty levels and people's living standards. HIES in Bangladesh is a periodic cross-sectional survey conducted every five years by the Bangladesh Bureau of Statistics (BBS). The present study used data from the most recent HIES conducted in 2016–2017. A stratified, two-stage random sample design was adopted for the HIES 2016–2017. In the first stage, primary sampling units (PSUs) throughout the country from 20 strata (8 rural, 8 urban, and 4 metropolitan areas) were randomly selected to achieve national representation. A total of 2304 PSUs were selected using systematic random sampling from the list of 2011 housing and population census enumeration areas. A PSU is usually a geographically constructed area, or a part of an area, called an enumeration area (EA), containing a number of households, created from the most recent population census. In the second stage, 20 households within each PSU were randomly selected (BBS, 2016). Using this sampling technique, a total of 46,080 households were included in HIES 2016–2017. Among the selected households, a total of 186,076 individuals were interviewed. Data collection was performed between April 1, 2016 and 31 March 2017. The survey objectives, sampling technique, survey design, survey instruments, measuring system, and quality control have been described elsewhere [25]. The participants for the current analysis were selected based on the following inclusion criteria: (1) an individual who had suffered from any chronic illness in the last 30 days, and (2) an individual who had received any treatment due to chronic illness in the last 30 days at the interview time. Based on these inclusion criteria, a total of 12,005 participants were selected for analytical exploration in this study.

Study variables

This study considered 'patient's utilisation of healthcare services due to chronic illness as an outcome variable. As a measure of their HCU related to chronic illness, participants responded to questions that asked them about any type of medical treatment: "Have you sought any type of medical treatment related

to your chronic illness in the last 30 days?" Response options were recoded as dichotomous ('yes' if the patient received any type of medical treatment due to illness, or 'no' otherwise).

The explanatory variables considered in the study were demographic characteristics (gender, age, marital status, education, employment); type of chronic disease (e.g., chronic heart disease, respiratory diseases, gastric or ulcer, blood pressure, arthritis or rheumatism, diabetes, chronic fever, and other diseases); number of chronic comorbid conditions (one chronic condition, two chronic comorbid conditions and three or more chronic comorbid conditions); type of healthcare provider (public hospital, private clinic or hospital, pharmacy/dispensary, doctor's chamber, or others), type of healthcare services (inpatient or outpatient care); and location of the consulted healthcare provider (urban or rural).

Statistical analysis

In the analytical exploration, the logistic regression model was used to identify the potential factors that had a significant role in utilising healthcare services. In the regression model, the dependent variable (i.e., utilisation of health care services: chronic illness patients who received any type of medical treatment due to chronic illness in the last 30 days) was characterised as a dichotomous measure. The majority of the predictor variables were categorical in nature with two or more labels in this study. Therefore, an un-adjusted analysis was performed to find the association between outcome and the label of explanatory variables (Model 1). The regression outcomes were expressed by disease cluster. For all diseases, the unadjusted explorations were expressed in Model 1, where most of the patients with chronic diseases were found to be significantly associated with lower or higher health care utilisation for both genders (all $p < 0.05$). After step-by-step adjustment of independent confounding factors, we adjusted different variables into seven different models (i.e., all variables related to type of health care were adjusted in Model 2). These were performed to present the variables that were significant in Models 2 to Model 7, in order to understand how those variables are modified in the final model where all the variables were adjusted at the same time in the final Model 8.

The predictor variables were included in the adjusted model only if any label of the predictor was significant at 5% or less risk level in the unadjusted model, which was used to adjust for other potential confounders. Insignificant predictors were not included in the adjusted model. For the independent variables, the category found to be least at risk of having patients' preferences of health care services related to chronic illness in the analysis was considered the reference category for constructing relative risk ratios (RRR). Statistical significance was considered at the 5% risk level. All data analyses were undertaken using the statistical software Stata/SE 14 (StataCorp, College Station, TX, USA).

Results

Participants' characteristics and distribution of chronic diseases

The total sample consisted of 12,005 patients (≈ 50% of male) with one or more medically diagnosed chronic diseases (Table 1). Forty-two percent of male patients were young (18 to 45 years), and approximately 50% were married. However, one-third of patients had no formal education. Fifty-three percent of male patients were employed in the labour force, whereas only eight percent of female patients were employed. Most patients (94% of male and 92% of female) respondents reported at least one disability. The five most prevalent chronic diseases among multimorbid patients were gastric/ulcer (Male/Female (M/F):16.77% / 16.40%), arthritis/rheumatism (M/F:13.70% / 13.86%), respiratory diseases/asthma/bronchitis (M/F: 12.09% / 12.55%), chronic heart disease (M/F: 8.30% / 7.41%), and blood pressure (M/F: 8.20% / 8.87%). Most of the patients utilised outpatient health care services, with two-third of patients receiving health care from private hospitals or clinics usually in rural locations. Eighty-three percent of patients reported 30 minutes (overall) or less waiting time to receive health care services.

Table 1
Distribution of patient's characteristics and utilisation of health care services, by gender

Participant characteristics	Male patients		Female patients	
	Number of patients, n (%)	Utilisation of healthcare, % (95% CI)	Number of patients, n (%)	Utilisation of healthcare, % (95% CI)
Age in years				
<18 years	2,292 (38.28)	38.21 (36.9, 39.54)	2,210 (36.72)	36.82 (35.51, 38.14)
18–35 years	1,748 (29.20)	29.07 (27.85, 30.32)	2,011 (33.42)	33.28 (32.01, 34.57)
36–45 years	778 (12.99)	12.86 (11.97, 13.80)	715 (11.88)	11.8 (10.95, 12.70)
46–64 years	859 (14.35)	14.75 (13.81, 15.74)	806 (13.39)	13.24 (12.35, 14.19)
65 or more	310 (5.18)	5.11 (4.54, 5.74)	276 (4.59)	4.87 (4.32, 5.49)
Educational background				
No education	2,208 (36.88)	36.78 (35.48, 38.11)	2,190 (36.39)	36.24 (34.94, 37.56)
Up to primary	1,739 (29.05)	28.94 (27.72, 30.19)	1,776 (29.51)	29.58 (28.35, 30.84)
Secondary education	1,608 (26.86)	26.97 (25.78, 28.20)	1601 (26.60)	26.56 (25.38, 27.78)
Higher	432 (7.22)	7.31 (6.63, 8.05)	451 (7.49)	7.62 (6.93, 8.38)
Marital status				
Currently married	2,961 (49.46)	49.55 (48.19, 50.91)	3,164 (52.58)	52.54 (51.18, 53.90)
Never married	2,258 (37.72)	37.69 (36.38, 39.02)	1,657 (27.53)	27.21 (26.02, 28.44)
Widowed/divorced/separated	768 (12.83)	12.76 (11.88, 13.70)	1197 (19.89)	20.25 (19.18, 21.36)
Religion status				
Islam	5,188 (86.65)	86.81 (85.86, 87.71)	5,222 (86.77)	86.97 (86.03, 87.86)

Participant characteristics	Male patients		Female patients	
	Number of patients, n (%)	Utilisation of healthcare, % (95% CI)	Number of patients, n (%)	Utilisation of healthcare, % (95% CI)
Hinduism	601 (10.04)	9.95 (9.16, 10.79)	595 (9.89)	9.95 (9.16, 10.79)
Others	198 (3.31)	3.24 (2.79, 3.76)	201 (3.34)	3.08 (2.64, 3.59)
Employed status				
Employed	3,196 (53.38)	53.2 (51.80, 54.50)	491 (8.16)	7.81 (7.11, 8.58)
Unemployed	2,791 (46.62)	46.8 (45.50, 48.20)	5,527 (91.84)	92.19 (91.42, 92.89)
Any type of disability				
Yes	5,636 (94.14)	94.04 (93.36, 94.66)	5,560 (92.39)	92.42 (91.67, 93.11)
No	351 (5.86)	5.96 (5.34, 6.64)	458 (7.61)	7.58 (6.89, 8.33)
Type of chronic illness				
Chronic heart disease	497 (8.30)	8.96 (8.22, 9.77)	446 (7.41)	7.78 (7.08, 8.54)
Respiratory diseases/ Asthma/Bronchitis	724 (12.09)	12.53 (11.66, 13.46)	755 (12.55)	12.86 (11.97, 13.79)
Gastric/ulcer	1,004 (16.77)	16.04 (15.07, 17.06)	987 (16.40)	15.78 (14.82, 16.8)
Blood pressure	491 (8.20)	8.31 (7.59, 9.09)	534 (8.87)	8.83 (8.09, 9.64)
Arthritis/Rheumatism	820 (13.70)	13.69 (12.78, 14.65)	834 (13.86)	14.03 (13.11, 15.00)
Diabetes	351 (5.86)	6.23 (5.60, 6.92)	357 (5.93)	6.37 (5.74, 7.07)
Chronic fever	378 (6.31)	5.49 (4.91, 6.15)	361 (6.00)	5.20 (4.62, 5.83)
Others	1,722 (28.76)	28.74 (27.53, 29.99)	1,744 (28.98)	29.16 (27.94, 30.41)
Type of healthcare received				

Participant characteristics	Male patients		Female patients	
	Number of patients, n (%)	Utilisation of healthcare, % (95% CI)	Number of patients, n (%)	Utilisation of healthcare, % (95% CI)
Inpatient care	521 (8.70)	9.40 (8.60, 10.20)	518 (8.61)	9.40 (8.60, 10.20)
Outpatient care	5,466 (91.30)	90.60 (89.80, 91.40)	5,500 (91.39)	90.60 (89.80, 91.40)
Types of health facilities				
Public facilities	1,024 (17.10)	19.70 (18.70, 20.80)	999 (16.60)	19.2 (18.20, 20.30)
Private facilities	3,937 (65.76)	75.90 (74.70, 77.00)	3,970 (65.97)	76.4 (75.20, 77.50)
Others	1,026 (17.14)	4.40 (3.80, 4.90)	1,049 (17.43)	4.4 (3.90, 5.00)
Waiting times for treatment				
<30 minutes	5017 (83.80)	81.30 (80.21, 82.34)	5026 (83.52)	80.93 (79.84, 81.97)
>30 minutes	970 (16.20)	18.70 (17.66, 19.79)	992 (16.48)	19.07 (18.03, 20.16)
Consulted provider location				
Rural based	2,719 (52.42)	52.42 (51.06, 53.78)	2,744 (52.79)	52.79 (51.43, 54.15)
Urban based	2,468 (47.58)	47.58 (46.22, 48.94)	2,454 (47.21)	47.21 (45.85, 48.57)
Overall	5,987 (49.87)	86.64 (85.75, 87.48)	6,018 (50.13)	86.34 (85.45, 87.19)

<Table 1 insert here>

Distribution of health care utilisation (HCU)

The distribution of HCU due to chronic diseases by gender is presented in Table 1. Approximately overall 86% of patients had utilised health care services in the last 30 days before the survey. The utilisation of health care reduced as patients aged. For instance, approximately one-third of the patients aged 18–35 years sought health care, which was only around 5% among the patients aged 65 years or more. Fifty percent of married patients received any type of health care services (49.55% for males and 52.58% for females), which was relatively lesser among single participants. A significant difference in the prevalence of HCU was found between employed males (53.2%; 95% CI: 51.80, 54.50]) and female patients (7.81%,

95% CI: 7.11, 8.58]). However, approximately 92% of unemployed female patients utilised health care compared to their unemployed male counterparts (47%). Patients who experienced gastric/ulcer sought health care most among both male (16.04% [95% CI: 15.07, 17.06]) and female respondents (15.78% [95% CI: 14.82, 16.80]), while chronic fever was found to be the lowest health care seeking disease for both genders.

The majority of patients' highest rate of HCU was observed among those receiving outpatient care compared to that of the inpatient care (90.60% vs. 9.40% for both genders). Health care utilisation was lower among those who had to wait more than 30 minutes for treatment than those who had to wait < 30 minutes in both genders (81.30% vs. 18.7% for males; 80.93% vs. 18.03% for females). The HCU was highest among those who received care from private facilities than public facilities in both male (75.90% [95% CI: 74.70, 77.00] vs. 19.70% [95% CI: 18.70, 20.80]) and female patients (76.4% [95% CI: 75.20, 77.50] vs. 19.2% [95% CI: 18.20, 20.30]).

Correlations of chronic disease-specific and gendered HCU

Table 2 presents the detail results of regression analysis using eight disease-specific different models (Model 1 to Model 8). In the final model (Model 8), patients who were diagnosed with chronic heart disease, diabetes, gastric/ulcer and chronic fever had a significant association with HCU for both genders (all $p < 0.05$). We found that patients with chronic heart disease had significantly higher HCU compared to patients with other chronic diseases. However, the magnitude of association was higher among male patients (OR = 2.22; 95% CI:1.51–3.26; $p < 0.001$) than their female counterparts (OR = 1.44; 1.02–2.04; $p = 0.041$). Similarly, diabetes patients reported significant HCU in both genders (OR = 1.82; 1.21–2.74; $p = 0.004$ for male patients and OR = 1.97, 1.28-3.00; $p = 0.002$ for female patients). The magnitude of HCU also depended on the severity of diseases. For example, patients with gastric/ulcer had significantly lower HCU [23% for male patients, (OR = 0.77; 0.62–0.95; $p = 0.017$) or 22% for female patients, (OR = 0.78; 0.63–0.97; $p = 0.026$)] compared to patients diagnosed with other diseases. A similar association was observed for patients diagnosed with chronic fever (for male patients, OR = 0.49; 0.38–0.65; $p = 0.026$ or female patients, OR = 0.46; 0.35–0.61; $p < 0.001$).

Table 2
Association between chronic disease-specific health care utilisation and related factors, by gender

Models	Health care utilisation			
	Male patients		Female patients	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Chronic heart disease				
Model 1	2.25 (1.53, 3.31)	< 0.001	1.45 (1.03, 2.06)	0.034
Model 2	2.22 (1.51, 3.27)	< 0.001	1.43 (1.01, 2.03)	0.042
Model 3	2.23 (1.52, 3.27)	< 0.001	1.43 (1.01, 2.03)	0.043
Model 4	2.23 (1.52, 3.28)	< 0.001	1.43 (1.01, 2.03)	0.042
Model 5	2.22 (1.51, 3.27)	< 0.001	1.43 (1.01, 2.02)	0.045
Model 6	2.22 (1.51, 3.27)	< 0.001	1.43 (1.01, 2.03)	0.042
Model 7	2.22 (1.51, 3.26)	< 0.001	1.44 (1.02, 2.04)	0.040
Model 8	2.22 (1.51, 3.26)	< 0.001	1.44 (1.02, 2.04)	0.041
Diabetes				
Model 1	1.79 (1.19, 2.69)	0.006	1.92 (1.26, 2.94)	0.002
Model 2	1.81 (1.20, 2.74)	0.004	1.94 (1.27, 2.96)	0.002
Model 3	1.82 (1.21, 2.74)	0.004	1.95 (1.28, 2.98)	0.002
Model 4	1.82 (1.21, 2.74)	0.004	1.95 (1.27, 2.97)	0.002
Model 5	1.82 (1.21, 2.74)	0.004	1.94 (1.27, 2.97)	0.002
Model 6	1.82 (1.21, 2.74)	0.004	1.96 (1.28, 3.00)	0.002
Model 7	1.82 (1.21, 2.75)	0.004	1.96 (1.28, 3.00)	0.002
Model 8	1.82 (1.21, 2.74)	0.004	1.97 (1.29, 3.01)	0.002
Respiratory diseases/Asthma/Bronchitis				
Model 1	1.36 (1.03, 1.80)	0.030	1.16 (0.89, 1.51)	0.267
Model 2	1.40 (1.06, 1.84)	0.019	1.19 (0.91, 1.55)	0.196
Model 3	1.40 (1.06, 1.85)	0.018	1.19 (0.91, 1.55)	0.197
Model 4	1.40 (1.06, 1.85)	0.018	1.19 (0.91, 1.55)	0.194
Model 5	1.40 (1.06, 1.85)	0.018	1.19 (0.91, 1.55)	0.198
Model 6	1.40 (1.06, 1.85)	0.018	1.19 (0.92, 1.56)	0.188

Models	Health care utilisation			
	Male patients		Female patients	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Model 7	1.40 (1.06, 1.85)	0.018	1.20 (0.92, 1.56)	0.183
Model 8	1.40 (1.06, 1.85)	0.018	1.20 (0.92, 1.56)	0.179
Gastric/ulcer				
Model 1	0.75 (0.60, 0.93)	0.009	0.74 (0.60, 0.92)	0.007
Model 2	0.77 (0.62, 0.96)	0.018	0.77 (0.62, 0.95)	0.017
Model 3	0.77 (0.62, 0.95)	0.017	0.77 (0.62, 0.96)	0.019
Model 4	0.77 (0.62, 0.95)	0.017	0.77 (0.62, 0.96)	0.019
Model 5	0.77 (0.62, 0.96)	0.017	0.77 (0.62, 0.96)	0.021
Model 6	0.77 (0.62, 0.95)	0.017	0.78 (0.63, 0.97)	0.024
Model 7	0.77 (0.62, 0.95)	0.017	0.78 (0.63, 0.97)	0.025
Model 8	0.77 (0.62, 0.95)	0.017	0.78 (0.63, 0.97)	0.026
Blood pressure				
Model 1	1.11 (0.82, 1.51)	0.490	0.93 (0.70, 1.23)	0.587
Model 2	1.14 (0.84, 1.54)	0.400	0.96 (0.72, 1.27)	0.771
Model 3	1.15 (0.85, 1.55)	0.381	0.97 (0.73, 1.28)	0.807
Model 4	1.15 (0.85, 1.56)	0.367	0.96 (0.73, 1.28)	0.801
Model 5	1.15 (0.85, 1.56)	0.368	0.96 (0.73, 1.28)	0.795
Model 6	1.15 (0.85, 1.56)	0.366	0.97 (0.73, 1.28)	0.819
Model 7	1.15 (0.85, 1.56)	0.373	0.97 (0.73, 1.29)	0.839
Model 8	1.15 (0.85, 1.56)	0.372	0.97 (0.74, 1.29)	0.860
Arthritis/Rheumatism				
Model 1	1.00 (0.78, 1.28)	1.000	1.05 (0.82, 1.34)	0.702
Model 2	1.04 (0.81, 1.33)	0.749	1.10 (0.86, 1.41)	0.458
Model 3	1.04 (0.81, 1.33)	0.749	1.10 (0.86, 1.41)	0.450
Model 4	1.04 (0.82, 1.33)	0.746	1.10 (0.86, 1.41)	0.459
Model 5	1.04 (0.81, 1.33)	0.753	1.09 (0.85, 1.40)	0.486

Models	Health care utilisation			
	Male patients		Female patients	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Model 6	1.04 (0.81, 1.33)	0.752	1.10 (0.86, 1.41)	0.458
Model 7	1.04 (0.81, 1.32)	0.775	1.10 (0.86, 1.41)	0.451
Model 8	1.04 (0.81, 1.32)	0.777	1.10 (0.86, 1.41)	0.444
Chronic fever				
Model 1	0.47 (0.36, 0.62)	< 0.001	0.45 (0.34, 0.59)	< 0.001
Model 2	0.49 (0.38, 0.65)	< 0.001	0.45 (0.34, 0.60)	< 0.001
Model 3	0.50 (0.38, 0.65)	< 0.001	0.46 (0.35, 0.60)	< 0.001
Model 4	0.50 (0.38, 0.65)	< 0.001	0.46 (0.35, 0.61)	< 0.001
Model 5	0.49 (0.38, 0.65)	< 0.001	0.46 (0.35, 0.61)	< 0.001
Model 6	0.49 (0.38, 0.65)	< 0.001	0.46 (0.35, 0.61)	< 0.001
Model 7	0.49 (0.38, 0.65)	< 0.001	0.46 (0.35, 0.61)	< 0.001
Model 8	0.49 (0.38, 0.65)	< 0.001	0.46 (0.35, 0.61)	< 0.001

Note: Model 1: Unadjusted; Model 2: adjusted for type of health care; Model 3: adjusted for Model 2 + age, Model 4: adjusted for Model 3 + educational background; Model 5: Adjusted for Model 4 + religion status; Model 6: adjusted for Model 5 + marital status; Model 7: adjusted for Model 6 + employment status; Model 8: adjusted for Model 7 + type of health care facilities, consultation provider's location and waiting times.

<Table 2 insert here>

Discussion

This study examined the disease-stratified and gender- differentiated HCU in Bangladesh among adult patients with chronic diseases. The major chronic diseases reported among the participants were chronic heart disease, respiratory diseases/asthma/bronchitis, gastric/ulcer, blood pressure, arthritis/rheumatism, diabetes, and chronic fever were found alike among males and females. However, the magnitude of seeking healthcare services due to these chronic conditions varied across the type of chronic diseases. For example, participants with chronic heart disease, diabetes, and respiratory diseases reported highest HCU in both genders, while chronic fever had the least HCU.

The seeking of healthcare services may be influenced by disease severity and various demographic and socioeconomic factors. The burden of chronic diseases combined with frequent acute illness episodes increases the risk of high levels of long-term adverse events (e.g., comorbidity, mortality, disability)

compared to other diseases [5, 8, 26, 27]. Patients with chronic illness also have a greater risk of being diagnosed with other associated comorbidities, which increase utilisation of healthcare services [28]. Chronic diseases damage the lives and adversely affect the quality of life and ultimate disability, which increases the HCU among affected patients [29]. Long-lasting chronic conditions result in a continuation of treatment and care, which increases the use of healthcare resources (e.g., specialist consultations, diagnostic, medicines) [30, 31]. The severity of the chronic illness (i.e. heart disease, diabetes) leads to more health care service utilisation, increasing the economic burden compared to the other diseases [13].

Taking a gendered perspective to disease-specific chronic illnesses shows the magnitude of HCU differs significantly between males and females. For instance, male patients with chronic heart disease utilised healthcare services at a rate more than two times higher compared to female patients. This trend was also consistenct for respiratory diseases and blood pressure, although females slightly utilised more healthcare services for diabetes. Generally, the lower utilisation of healthcare among females in Bangladesh compared to males mainly depends on who is making the HCU decision, financial capability and accessibility power, knowledge and awareness [32–38]. One study reported that the Bangladeshi males are more unwilling to adhere and then discontinue treatment for chronic heart disease (i.e. hypertension) compared to females [39]. These practices among males may lead to the recurrence of chronic heart diseases like hypertension and trigger more HCU for heart dieseases. Another study in Bangladesh showed that the male-headed family heritage leads to demotivated women's decisions about their healthcare even when there is agreement from senior family members, especially husbands and/or mothers-in-law [40]. This supports the finding of another study [41] that showed that 37% of Bangladesh women had no decision-making power about their healthcare. This was even more extreme at 55.6% as reported in India [42]. However, studies in Spain and USA reported that older female adults were more likely to use medical practitioners and outpatient health services and medications than men [43, 44]. The USA women face a higher rate of disability and poor health conditions and were not more likely to receive the prescribed drugs due to cost [44, 45]. Besides, males have to pay much more for HCU due to the higher rate of obesity and cardiovascular problems [46]. In addition, the location of healthcare service providers, disproportionate population density, and education are crucial factors for seeking healthcare [47–49]. Access to money for their own healthcare is an influential factor for women's HCU. A study expressed that only 14% of married women can decide on their health care in Ethiopia, while only 38% can use money independently for their healthcare [33]. Studies in India [50, 51] reported high (about 50%) gender disparity in healthcare expenditure which increased for older patients and also women's healthcare needs are regularly and often neglected or have less priority in households.

In the UK women who get support from their husbands in decision making had a higher odds of HCU and it increased in urban areas compared to rural areas [52]. Another study in UK showed that males are 32% less likely to have a primary healthcare consultation than females [53]. The cultural consequences exposed that the HCU may depend on disease severity and magnitude of health burden, especially for women. It is not necessarily true that the males are more conscious and knowledge enriched about the chronic diseases in Bangladesh that may influence the overall lower HCU.

Nevertheless, during recent years, remarkable success and changes have occurred in maternal HCU in Bangladesh. However, there still low HCU and women autonomy practices, particularly in rural areas, and particularly for women with lower education and socioeconomic status [38, 54, 55]. The above evidence indicates that being a south Asian country, there exists a significant gap in opportunities and privileges for women in Bangladeshi families. Social supports, risk-pooling mechanisms, early risk detections and community-based awareness programs may contribute to achieving universal health coverage for women over time.

The current study utilised the most recent household income and expenditure survey data which is nationally representative of the Bangladeshi population. These national-level data makes the study findings more precise and reliable. However, there are still some limitations regarding this study which the authors acknowledge. For instance, self-reported data of the key variables of interest were used, findings should be interpreted cautiously. In addition, the survey data consist of information about self-reported illness, utilisation of healthcare services, and expenditure that might be affected by recall bias, although only information from the last 30 days was considered, which reduces the chances of potential recall bias due to the short recall period. The cross-sectional studies are normally a type of observational study design, therefore, it is difficult to determine any causal relationships among variables.

Conclusions

The present study focused on chronic disease-stratified and gender-based HCU in Bangladesh. HCU due to chronic illness is significantly higher among the male population than females. The circumstances demand that affordable and accessible healthcare services are urgently needed for women, especially in rural areas. The government and other related organisations should focus on improved healthcare system planning, healthcare service quality improvement strategies and special healthcare benefits for disadvantaged individuals, especially women. Social supports, risk-pooling mechanisms, early risk detections and community-based awareness development may contribute to progressing universal health coverage. In addition, resource allocation, capacity building, technology enabled health system can be considered to cope with the new challanges during this current pandemic and post-COVID healthcare management. Further rigorous research should be conducted to understand the core factors, exchange and enhance the beliefs and knowledge about chronic diseases and their gendered treatment in Bangladesh.

Declarations

Ethical Approval

The datasets were collected and made publicly available by the Bangladesh Bureau of Statistics (BBS).

Since the de-identified data for this study came from secondary sources, this study did not require ethical approval.

Consent to participate: Not applicable

Consent for publication: Not applicable

Availability of data and materials:

This research was carried out using the 2016-2017 Bangladesh Household Income and Expenditure Survey. The data underlying this article will be shared on reasonable request to the corresponding author after getting approval from the data authority.

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Author contribution

RAM designed the study. RAM designed the Analytical strategy and analysed the data. RAM, MAR, MPM, and SK helped to interprete the findings, under the supervision of KA and JG. RAM, SK, MAR, and SKM conducted the literature review and help to prepare the Introduction, and Methods sections under the supervision of KA and JG. MPM and MS drafted the Discussion. All authors reviewed and provided critical feedback on this manuscript. All authors read and approved this version for publication.

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