Determinants of health seeking behavior for chronic non-communicable diseases and related out-of-pocket expenditure: results from a cross-sectional survey in northern Bangladesh

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Abstract

Background: In spite of high prevalence rates, little is known about health seeking and related expenditure for chronic non-communicable diseases in low-income countries. We assessed relevant patterns of health seeking and related out-of-pocket expenditure in Bangladesh.

Methods: We used data from a household survey of 2500 households conducted in 2013 in Rangpur district. We employed multinomial logistic regression to assess factors associated with health seeking choices (no care or self-care, semi-qualified professional care, and qualified professional care). We used descriptive statistics (5% trimmed mean and range, median) to assess related patterns of out-of-pocket expenditure (including only direct costs).

Results: Eight hundred sixty-six (12.5%) out of 6958 individuals reported at least one chronic non-communicable disease. Of these 866 individuals, 139 (16%) sought no care or self-care, 364 (42%) sought semi-qualified care, and 363 (42%) sought qualified care. Multivariate analysis confirmed that the following factors increased the likelihood of seeking qualified care: a higher education, a major chronic non-communicable disease, a higher socio-economic status, a lower proportion of chronic household patients, and a shorter distance between a household and a sub-district public referral health facility. Seven hundred fifty-four (87%) individuals reported out-of-pocket expenditure, with drugs absorbing the largest portion (85%) of total expenditure. On average, qualified care seekers encountered the highest out-of-pocket expenditure, followed by those who sought semi-qualified care and no care, or self-care.

Conclusion: Our study reveals insufficiencies in health provision for chronic conditions, with more than half of all affected people still not seeking qualified care, and the majority still encountering considerable out-of-pocket expenditure. This calls for urgent measures to secure better access to care and financial protection.

Keywords: Non-communicable diseases, Chronic illness, Health-seeking behavior, Out-of-pocket expenditure, Multinomial logistic regression

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Background

Chronic non-communicable diseases (CNCDs) are controllable, although not curable conditions [1] that persist in individuals for a prolonged time, usually without any known transmitting agents [2]. The World Health Organization (WHO) highlighted that 68% of total worldwide deaths in 2012 were caused by CNCDs, and that three quarters of these deaths occurred in low- and middle-income countries (LMICs). Southeast Asia faced the highest increase in CNCD deaths [3].

Still, research on CNCDs in Southeast Asia is scarce, and it is mostly limited to establishing the prevalence of CNCDs and the associated risk factors [4, 5]. Little is known about how CNCD cases interact with the health system, with patients’ health-seeking choices, and with related out-of-pocket expenditure (OOPE) [6].

Likewise, Bangladesh has limited CNCD research, mostly focused on assessing the prevalence of selected CNCDs and their risk factors [7]. Although CNCDs account for 61% of the total disease burden in Bangladesh [8], few studies have explored related health seeking, and were concentrated in demographic surveillance sites in southern and central Bangladesh [9, 10]. Even fewer studies exist on OOPE for CNCDs, although evidence indicates that households affected by CNCD deaths are more likely to be impoverished [11].

The lack of information on health seeking choices and related expenditure makes it impossible to identify potential gaps in service provision and financial protection. In turn, an understanding of potential system failures in adequately addressing CNCDs is essential for designing policies and programs that can effectively counteract the challenge posed by CNCDs, encourage movement towards universal health coverage, and consequently secure progress towards the Sustainable Development Goals (SDGs).

We aimed to fill this existing knowledge gap by exploring health-seeking behavior for CNCDs, its determinants, and related household OOPE in northern Bangladesh.

Methods

Study settings

Data for our study was collected in Rangpur district, located in northwestern Bangladesh. The district, which has a population of about 3 million people [12], experiences the highest poverty rate in the country, with 42% of all people living below the national poverty line [13]. Rangpur’s health system reflects medical pluralism in Bangladesh: there co-exist public, private for-profit, and private not-for-profit providers [14]. Although CNCD policies are in place [15, 16], their implementation has been slack [8]. In the public sector, tertiary facilities are prime providers for CNCDs [8, 17] (e.g., Rangpur Medical College hospital), whereas Upazilla Health Complexes (UHCs) offer basic services [17].

Sampling

We used data from a household survey of 2500 households conducted in June–July 2013. It was a baseline or scoping survey for an upcoming health insurance scheme. The aim of the survey was to understand the practices and the differences among the sub-districts where the program was supposed to be implemented. The rationales for purposive sampling were driven by the needs of the upcoming health insurance program. Multi-stage cluster sampling techniques were applied to identify the households to be included in the survey. A mixture of random and purposive selection techniques were applied at each stage of sampling (Fig. 1). First, the survey purposely selected 5 out of 8 sub-districts (i.e., Upazilla): Rangpur Sadar, Badarganj, Mithapukur, Pirganj, and Pirgacha. These five sub-districts were selected purposively out of the 8 sub-districts as a programmatic decision, as a health coverage scheme was supposed to be rolled out in these 5 sub-districts. Second, within each sub-district, the Sadar union (i.e., main town of the sub-district) was purposely selected, and another union from the remaining unions (5–17 unions per sub-district) was randomly selected. The purposive selection of 5 main towns of 5 sub-districts was also a programmatic decision, taken with the intention to see if the circumstances of a sub-district’s Sadar Union (i.e., main town) differs from the rest of the unions. In each sub-district, there is one union that is considered the main town (called Sadar Union), which is either an urban or peri-urban area, and the remaining unions are considered rural areas. Third, in each union, we randomly selected 5 out of 50–55 BRAC Shasthya Shebika1 (SS), i.e., BRAC community health volunteers. Finally, we used systematic random sampling to select 50 households among each SS’s target population (150–200 households).

Data collection

Trained enumerators administered a structured questionnaire to sampled households. Household heads and their spouses responded on behalf of all individuals living in a household. The questionnaire gathered information on the household’s socio-demographic and economic profile, self-reported illnesses (both acute and chronic conditions), and related health-seeking behavior, health expenditure, and participation in microfinance institutions. Enumerators also

1Shasthya Shebika (SS) are a set of female community health volunteers who are trained by BRAC to provide essential health care services in the communities. They are volunteers, not workers of BRAC; they are not paid by BRAC but earn money by selling basic medications and services. At present, numbers of SS have scaled up to nearly 100,000 from around 1,000 in year 1990, operating in all districts of Bangladesh.
recorded the household’s Global Position System (GPS) location.

The survey defined chronic conditions as any condition that had lasted 3 months or more. The questionnaire explicitly probed for name and symptoms of chronic conditions expected to be included in a prospective insurance benefit package: hypertension, diabetes, asthma or chronic obstructive pulmonary disease (COPD), physical disability, joint pain or arthritis, cancer, chronic communicable conditions (tuberculosis, leprosy, kala-azar, and polio), and other chronic diseases. If respondents reported conditions beyond probed ones, they categorized it as “other conditions.” Because our focus was on CNCDs, we excluded chronic communicable conditions.

The Ethical Review Committee of the BRAC JPG School of Public Health, BRAC University reviewed and approved the study protocol shortly before data collection began in 2013. Interviewers obtained written informed consent from all respondents before interview.

Variables
We defined the primary outcome variable, health-seeking behavior, as the type of care sought by individuals reporting at least one CNCD in the past 30 days. The survey gathered self-reported information of health-seeking behavior and related expenditure for the past 30 days rather than for a longer 12-month period, as shorter recall periods have minimal recall bias and are more accurate [18, 19]. Shorter recall periods are more appropriate when capturing micro level data than are longer recall periods [20]. Moreover, our study has followed a similar study done recently in Malawi (another low-resource setting like Bangladesh), where a 30-day recall period had been used to collect self-reported health-seeking information and expenditure related to chronic non-communicable diseases [21].

We categorized care seeking as: no care or self-care, semi-qualified professional care, and qualified professional care. From a conceptual viewpoint, this classification reflects real-life alternatives available in the pluralistic Bangladeshi context.

We defined instances as no care when a person did nothing to treat the reported condition and as self-care when a person engaged in treatment without the recommendation of a health provider, but instead followed their own advice or that of a family or friend [22]. We merged self-care and no care into one category owing to the low response rate, but applied the likelihood-ratio test in order to test beforehand for the feasibility of
Socio-economic status was measured by constructing the prior 30 days because we assumed a reduced ability presence of an acute illness episode in the household in sources and therefore to care [27]. We included the variable because we postulated that it may facilitate access to re-pation (by the household head and/or his/her spouse) in Malawi [21]. We included microfinance particip-

We defined instances as semi-qualified professional care when a person sought care from any allopathic or traditional provider with some degree of training and experience in primary care, but no specific expertise in CNCDs (e.g., medical assistants, village doctors, community health workers, drugstore keepers, and traditional healers) [9, 18, 22]. We defined instances as qualified professional care when a person sought care from registered and trained phys-

We defined the secondary outcome variable as total OOPE, incurred while seeking CNCD care during the prior 30 days, irrespective of sought care type. Our estimates included self-reported expenses for consultation, medications, diagnostics, transportation, and other related direct costs (e.g., informal pay, and accommodation). We could not analyze the single cost components of total OOPE except for medication expenses, owing to respondents’ difficulty in recalling them. We did not collect information on indirect costs.

Our selection of explanatory variables was guided by Andersen’s model of health-seeking behavior [24]. We have listed all explanatory variables with a hypothesized association with primary outcome in Table 1. Most of them are self-explanatory and reflect standard measurement practice in analyses pertaining to health-seeking behavior [21, 22].

To explore the effect of different CNCDs on care seeking while accounting for small numbers, we re-classified CNCDs into two groups: major CNCDs and minor CNCDs. Corresponding to disease burden estimates in Bangladesh and in South-Asia [15, 25, 26], we catego-

We defined instances as semi-qualified professional care and qualified professionals as the base category because they are expected to provide CNCD services [8, 17].

Analytical Approach
We conducted our analysis using STATA IC 13. We considered all results with P values less than 0.05 as statistically significant. We used univariate and bivariate descriptive statistics (analysis of variance-ANOVA, chi-square, or Fisher’s exact test) to explore the distribution of the variables and to identify associations with health-seeking behavior.

We used multinomial logistic regression (MNL) to confirm the associations identified in the bivariate analysis, between explanatory variables and health-seeking choices. We used MNL because our primary outcome variable included three answer categories (no care or self-care, semi-qualified professional care, and qualified professional care). The equation is [23] as follows:

\[
\Pr(y = m|x) = \frac{\exp(x\beta_m)}{\sum_{j=1}^{3} \exp(x\beta_j)}, \text{ for } m = 1, 2 \text{ or } 3
\]

Here “m = 1” is seeking no care or self-care, “m = 2” is seeking semi-qualified professional care and “m = 3” is seeking qualified professional care. We set care by qualified professionals as the base category because they are considered the highest-level health providers in

2Tube-wells are a source of drinking water. But not all households that have tube-wells drink water from them.

3As the population’s health consciousness increases, ponds are less likely to be a source of drinking water: they are more of a household cleaning water source.
Table 1 Variables, their measurements, and hypotheses

| Variables and their measurement | Hypothesized direction of explanatory variables' influence on primary outcome | No/self-care vs. qualified care | Semi-qualified care vs. qualified care |
|--------------------------------|--------------------------------------------------------------------------------|----------------------------------|--------------------------------------|
| Primary outcome variable: type of health seeking | | | |
| 1 = No care/self-care | NA | NA |
| 2 = Semi-qualified professional care | | | |
| 3 = Qualified professional care | | | |
| Secondary outcome variable: total out-of-pocket expenditure incurred to seek CNCD care in prior 30 days (Continuous variable) | | | |
| **Explanatory variables** | | | |
| **Individual characteristics** | | | |
| Age: Continuous variable | +/- | +/- |
| Duration of illness (months): Continuous variable | - | - |
| Sex: | +/- | +/- |
| 0 = Male | | |
| 1 = Female | | |
| Education: | - | - |
| 0 = No schooling | | |
| 1 = Primary level and above | | |
| Marital status: | +/- | +/- |
| 0 = Currently not married | | |
| 1 = Currently married | | |
| Occupational status: | - | - |
| 0 = Non-income generating | | |
| 1 = Income generating | | |
| Being household head: | - | - |
| 0 = No | | |
| 1 = Yes | | |
| Comorbidity: | - | - |
| 0 = No comorbidity | | |
| 1 = Comorbidity | | |
| Category of CNCDs: | - | - |
| 0 = Minor CNCDs, 1 = Major CNCDs | | |
| **Household characteristics** | | | |
| Household size (no. of members): continuous variable | + | + |
| Socio-economic status/ asset quintiles | - | - |
| 1 = 1st quintile (poorest) | | |
| 2 = 2nd quintile | | |
| 3 = 3rd quintile | | |
| 4 = 4th quintile | | |
| 5 = 5th quintile (least poor) | | |
| Proportion of household members with CNCD: continuous variable | + | + |
| MFI involvement of household head and/or spouse: | - | - |
| 0 = Not involved with MFI | | |
| 1 = Involved with MFI | | |
| Presence of acute illness in the household: | + | + |
| 0 = No, 1 = Yes | | |
| **Contextual characteristics** | | | |
| Distance between household and sub-district’s public health care facility (Upazilla Health Complex/Medical college hospital): continuous variable | + | + |
| Rural or urban residence: | - | - |
| 0 = Rural, 1 = Urban | | |
| Sub-district of residence : | +/- | +/- |
| 1 = Rangpur Sadar | | |
| 2 = Mithapukur | | |
Bangladesh [9, 22, 30] and are expected to provide adequate CNCD care. By setting them as a reference category, we effectively measured which individual, household, and contextual characteristics prevented people from accessing proper care.

We used a step-up approach to build our MNL model [31]. We started by running the MNL model with intercept only. We progressively added one explanatory variable each time to the model, privileging variables that had shown a significant association in bivariate analysis. After adding a new variable, we tested the model against the prior model using the likelihood ratio test. If the prior model was nested in a later model including an additional variable, then we kept the added variable. If not, we dropped the added variable. We repeated this process until we identified the final model. This approach explains why the final model contains fewer variables than those we had originally considered. We used the Hausman test and Small-Hsiao test to test the model assumption of Independence of Irrelevant Alternatives (IIA) [23].

We analyzed OOPE and its components in Bangladeshi Taka (BDT) (1USD≈78 BDT as of June–July, 2013, when data was collected). We used univariate descriptive statistics (5% trimmed mean and range (minimum-maximum), and median) to explore expenditure patterns and their distribution across health-seeking choices, individual, household, and contextual characteristics.

**Results**

We collected information on a total of 10,367 individuals, of which 6958 people were aged 15 years or above, and were therefore included in our analysis on CNCDs. Among those, 866 (12.5%) reported a total of 925 CNCDs. The characteristics of the entire sample and the respondents who had at least one CNCD are given in Table 2.

The three most commonly reported CNCDs were chronic joint pain/arthritis (n = 162), asthma/COPD (n = 151), and hypertension (n = 105) (Table 3). Among individuals with at least one CNCD, 139 (16%) sought no care or self-care, 364 (42%) sought semi-qualified care, and 363 (42%) sought qualified care (Table 4).

Table 4 reports the bivariate analysis results between their health seeking choices and explanatory variables. We found a positive association between seeking no or self-care and longer illness duration (P < 0.05), increasing proportion of household CNCD members (P < 0.001), and Mithapukur residents (P < 0.001). Respondents with primary education or more (P = 0.01), major CNCDs (P < 0.001), and from 2nd and 3rd asset quintiles (P < 0.001) were less likely to seek no or self-care.

Longer illness duration (P = 0.05), increasing proportion of household CNCD patients (P < 0.001), presence of acute illness in a household (P < 0.001), longer distance from the sub-district's public referral health facility (P = 0.05), and Mithapukur and Pirgacha residents (P < 0.001) were more likely to seek semi-qualified care. Major CNCD patients (P < 0.001) and respondents from higher asset quintiles (P < 0.001) were less likely to seek semi-qualified care.

Table 5 reports the results of MNL and model specifications. MNL analysis confirmed that respondents with primary education or more (β = −0.624, P = 0.007), with major CNCDs (β = −0.523, P = 0.03), and from 2nd (β = −0.794, P = 0.03), or 3rd asset quintiles (β = −0.841, P = 0.02) were less likely to seek no or self-care, compared to qualified care. It also confirmed that people from households with a higher proportion of CNCD patients (β = 1.561, P = 0.001), and from Mithapukur (β = 1.040, P = 0.01), were more likely to seek no or self-care than qualified care. However, MNL could not confirm associations between no or self-treatment and illness duration.

MNL analysis affirmed that households with a higher proportion of CNCD patients (β = 1.522, P < 0.001), a longer distance from the sub-district’s public referral health facility (β = 0.232, P < 0.001), urban respondents (β = 1.297, P = 0.01), and Mithapukur (β = 1.458, P < 0.001), or Pirgacha residents (β = 1.457, P < 0.001) more likely to seek semi-qualified care, compared to qualified professional care, and respondents with major CNCDs (β = −0.665, P < 0.001), and from 2nd (β = −0.893, P = 0.001), 3rd (β = −0.872, P = 0.002), 4th (β = −0.783, P = 0.005), or 5th (β = −0.987, P < 0.001) asset quintiles were less
Table 2    Socio-demographic and CNCD-related characteristics of entire sample and CNCD respondents

| Variable                                              | Entire sample | CNCD sample |
|-------------------------------------------------------|---------------|-------------|
|                                                      | N = 6958      | N = 866     |
| **Continuous variables**                              |               |             |
| Age (years)                                           | Mean 35.99    | Mean 43.83  |
|                                                       | SD 15.21      | SD 16.14    |
| Distance to the referral public health facility of the sub-district (km) | Mean 5.54 | Mean 4.91 |
|                                                       | SD 3.82       | SD 3.63     |
| Household size (number of members)                    | Mean 4.64     | Mean 4.32   |
|                                                       | SD 1.78       | SD 1.71     |
| Duration of illness (months)                          | NA            | Mean 43.77  |
|                                                       |               | SD 60.76    |
| Proportion of household members with CNCD             | NA            | Mean 0.41   |
|                                                       |               | SD 0.24     |
| **Categorical variables**                             |               |             |
| Sex:                                                  |               |             |
| Male                                                  | N 3518        | N 401       |
|                                                       | % 50.56       | % 46.3      |
| Female                                                | N 3440        | N 465       |
|                                                       | % 49.44       | % 53.7      |
| Education:                                            |               |             |
| No schooling                                          | N 2751        | N 435       |
|                                                       | % 39.55       | % 50.23     |
| Primary level education and above                     | N 4205        | N 431       |
|                                                       | % 60.45       | % 49.77     |
| Marital status:                                       |               |             |
| Currently not married                                 | N 1276        | N 75        |
|                                                       | % 18.34       | % 8.66      |
| Currently married                                     | N 5682        | N 791       |
|                                                       | % 81.66       | % 91.34     |
| Occupational status:                                 |               |             |
| Non-income generating                                 | N 3749        | N 486       |
|                                                       | % 53.88       | % 56.12     |
| Income generating                                     | N 3209        | N 380       |
|                                                       | % 46.12       | % 43.88     |
| Presence of acute illness patient in household:       |               |             |
| No                                                    | N 2471        | N 204       |
|                                                       | % 35.51       | % 23.56     |
| Yes                                                   | N 4487        | N 662       |
|                                                       | % 64.49       | % 76.44     |
| Category of CNCDs:                                   |               |             |
| Minor CNCDs                                           | NA            | N 555       |
|                                                       | NA            | % 64.09     |
| Major CNCDs                                           | NA            | N 311       |
|                                                       | NA            | % 35.91     |
| Asset Quintile/socio-economic status:                 |               |             |
| 1st quintile (poorest)                                | N 1095        | N 155       |
|                                                       | % 15.74       | % 17.9      |
| 2nd quintile                                          | N 1256        | N 163       |
|                                                       | % 18.05       | % 18.82     |
| 3rd quintile                                          | N 1351        | N 150       |
|                                                       | % 19.42       | % 17.32     |
| 4th quintile                                          | N 1479        | N 183       |
|                                                       | % 21.26       | % 21.13     |
| 5th quintile (least poor)                             | N 1777        | N 215       |
|                                                       | % 25.54       | % 24.83     |
| Being household head:                                |               |             |
| No                                                    | N 4466        | N 492       |
|                                                       | % 64.19       | % 56.81     |
| Yes                                                   | N 2492        | N 374       |
|                                                       | % 35.81       | % 43.19     |
| Microfinance involvement of household head and/or spouse: |     |             |
| Not involved                                          | N 3962        | N 410       |
|                                                       | % 56.94       | % 47.34     |
| Involved                                              | N 2996        | N 456       |
|                                                       | % 43.06       | % 52.66     |
| Rural or urban residence:                             |               |             |
| Rural                                                 | N 3372        | N 364       |
|                                                       | % 48.46       | % 42.03     |
| Urban                                                 | N 3586        | N 502       |
|                                                       | % 51.54       | % 57.97     |
| Sub-district of residence:                            |               |             |
| Rangpur Sadar                                         | N 1341        | N 83        |
|                                                       | % 19.27       | % 9.58      |
| Mithapukur                                            | N 1394        | N 473       |
|                                                       | % 20.03       | % 54.62     |
likely to seek semi-qualified care than qualified care. The
MNL did not confirm associations between illness dur-
ation, the presence of an acute illness in a household, and
the seeking of semi-qualified care.

Out of 866 respondents with a CNCD, 754 (87%) re-
ported regarding OOPE in the prior 30 days, and 85% of
total OOPE consisted of drug expenditure. Table 6
shows the distribution of total OOPE and drug expenses
across variables. People who sought qualified profes-
sional care, people suffering from a major CNCD, the
elderly (60 years old and above), and the least poor in-
curred the highest OOPE. Important differences were
observed across sub-districts, with Mithapukur residents
facing the lowest OOPE and Pirgacha residents facing
the highest.

Discussion
Our work makes an important contribution to the limited
pool of literature addressing health-seeking behavior for
CNCDs and related OOPE, being one of the very few rele-
vant studies in Southeast Asia, particularly in Bangladesh.
Moreover, our study distinguishes itself from prior studies
[9, 10] because, being based on population-based data, it
addresses a wider spectrum of CNCDs experienced di-
rectly by the respondents.

One out of every eight respondents reported at least one
CNCD, with the most commonly reported conditions being
joint pain/arthritis, asthma/COPD, and hypertension. Despite
our intention not to derive any epidemiological estimate of
disease prevalence, our findings are consistent with prior evi-
dence from INDEPTH surveillance sites in Asia, including
Bangladesh [4].

Among those who reported at least one CNCD, an impres-
sive 84% sought some sort of care. Contrary to previous find-
ings [9, 10], our study showed an equal split between the
seeking of qualified (42%) and of semi-qualified (42%) care.
Furthermore, our findings indicated that irrespective of pro-
vider choice, individuals faced considerable OOPE, mostly
owing to medication costs. Still, individuals who sought
qualified care spent substantially higher amounts, suggesting
a higher potential for catastrophic spending and impoverish-
ment in this group. Substantial OOPE indicates that national
policies stipulating CNCD prevention and control [15, 16]
are failing to translate into a corresponding reality [8, 32],
pushing people to purchase services and drugs at private pro-
viders [17]. This policy-implementation gap probably ex-
plains why such a large proportion of respondents bypassed
the formal system and sought semi-qualified care. This obvi-
ously raises fundamental questions about the adequacy and
quality of the care received [33], with important implications
for disease control.

Among the individual characteristics affecting service pro-
vider choice, gender and education stand most prominent,
and age to some extent. We found that lower education
limits access to qualified care. This depicts the role of cul-
tural capital (beyond socio-economic status) in shaping
health seeking decisions [9] and urgently calls for interven-
tions specifically reaching out to people with low educational

| Variable          | Entire sample | CNCD sample¹ |
|-------------------|---------------|--------------|
| Badarganj         | 1473          | 21.17        |
| Pirganj           | 1298          | 18.65        |
| Pirgacha          | 1452          | 20.87        |

¹Respondents reported to have at least one chronic non-communicable disease

This table shows the total conditions and their proportions as reported by 866 respondents. The conditions of 866 respondents add up to 925 because some people reported more than one condition.
Table 4 Bivariate analysis between type of health care-seeking behavior and explanatory variables, ($N = 866$)

| Variable and its measurement | No care or self-care ($N = 139$) | Semi-qualified professional care ($N = 364$) | Qualified professional care ($N = 363$) | Test statistics and $P$ value |
|-----------------------------|----------------------------------|---------------------------------------------|----------------------------------------|-----------------------------|
| **Individual characteristics** |                                  |                                             |                                        |                             |
| Age (years), mean (SD)       | 44.0 (16.5)                      | 42.6 (16.1)                                 | 45.0 (16.1)                            | $F(2, 863) = 1.92, P = 0.15$ |
| Duration of illness (months), mean (SD) | 53.6 (60.1)                     | 44.7 (65.6)                                 | 39.1 (55.4)                            | $F(2, 863) = 2.95, P = 0.05$ |
| Sex, n (%)                   |                                  |                                             |                                        |                             |
| Male                         | 63 (45.3)                        | 174 (47.8)                                  | 164 (45.2)                             | $X^2 = 0.57, df = 2, P = 0.75$ |
| Female                       | 76 (54.7)                        | 190 (52.2)                                  | 199 (54.8)                             |                             |
| Education, n (%)             |                                  |                                             |                                        |                             |
| No schooling                 | 83 (59.7)                        | 189 (51.9)                                  | 163 (44.9)                             | $X^2 = 9.54, df = 2, P = 0.008$ |
| Primary level and above      | 56 (40.3)                        | 175 (48.1)                                  | 200 (55.1)                             |                             |
| Marital status, n (%)        |                                  |                                             |                                        |                             |
| Currently not married        | 14 (10.1)                        | 34 (9.3)                                    | 27 (7.4)                               | $X^2 = 1.25, df = 2, P = 0.54$ |
| Currently married            | 125 (89.9)                       | 330 (90.7)                                  | 336 (92.6)                             |                             |
| Occupational status, n (%)   |                                  |                                             |                                        |                             |
| Non-income generating        | 77 (55.4)                        | 202 (55.5)                                  | 207 (57.0)                             | $X^2 = 0.21, df = 2, P = 0.90$ |
| Income generating            | 62 (44.6)                        | 162 (44.5)                                  | 156 (43.0)                             |                             |
| Being household head, n (%)  |                                  |                                             |                                        |                             |
| No                           | 77 (55.4)                        | 202 (55.5)                                  | 213 (58.7)                             | $X^2 = 0.89, df = 2, P = 0.64$ |
| Yes                          | 62 (44.6)                        | 162 (44.5)                                  | 150 (41.3)                             |                             |
| Comorbidity, n (%)           |                                  |                                             |                                        |                             |
| No comorbidity               | 122 (87.8)                       | 342 (94.0)                                  | 345 (95.0)                             | $X^2 = 8.94, df = 2, P = 0.01$ |
| Comorbidity                  | 17 (12.2)                        | 22 (6.0)                                    | 18 (5.0)                               |                             |
| Category of CNCDs, n (%)     |                                  |                                             |                                        |                             |
| Minor CNCDs                  | 103 (74.1)                       | 267 (73.4)                                  | 185 (51.0)                             | $X^2 = 46.79, df = 2, P < 0.001$ |
| Major CNCDs                  | 36 (25.9)                        | 97 (26.7)                                   | 178 (49.0)                             |                             |
| Household characteristics    |                                  |                                             |                                        |                             |
| Household size (members), mean (SD) | 4.25 (1.68)                   | 4.15 (1.63)                                 | 4.52 (1.78)                            | $F(2, 863) = 4.29, P = 0.01$ |
| Proportion of household members with CNCD, mean (SD) | 0.46 (0.25)                      | 0.45 (0.25)                                 | 0.34 (0.21)                            | $F(2, 863) = 22.89, P < 0.001$ |
| Asset Quintile, n (%)        |                                  |                                             |                                        |                             |
| 1st quintile (Poorest)       | 31 (22.3)                        | 88 (24.2)                                   | 36 (9.9)                               | $X^2 = 35.35, df = 8, P < 0.001$ |
| 2nd quintile                 | 24 (17.3)                        | 69 (19.0)                                   | 70 (19.3)                              |                             |
| 3rd quintile                 | 22 (15.8)                        | 62 (17.0)                                   | 66 (18.2)                              |                             |
| 4th quintile                 | 32 (23.0)                        | 75 (20.6)                                   | 76 (20.9)                              |                             |
| 5th quintile                 | 30 (21.6)                        | 70 (19.2)                                   | 115 (31.7)                             |                             |
| Microfinance involvement of household head and/or spouse, n (%)   |                                  |                                             |                                        |                             |
| No                           | 57 (41.0)                        | 173 (47.5)                                  | 180 (49.6)                             | $X^2 = 2.98, df = 2, P = 0.23$ |
| Yes                          | 82 (59.0)                        | 191 (52.5)                                  | 183 (50.4)                             |                             |
| Presence of acute illness in the household, n (%)   |                                  |                                             |                                        |                             |
| No                           | 34 (24.5)                        | 60 (16.5)                                   | 110 (30.3)                             | $X^2 = 19.35, df = 2, P < 0.001$ |
| Yes                          | 105 (75.5)                       | 304 (83.5)                                  | 253 (69.7)                             |                             |
levels. In contrast to prior literature on health seeking \[9, 34\], we found no evidence of a gender bias in health-seeking behavior and related expenditure. This appears surprising and calls for further qualitative inquiry to understand whether unexplored factors specific to CNCDs may mediate a different relation between gender and health-seeking behavior. Since our model could not be adjusted to control for illness reporting bias, we cannot exclude that in reality, gender plays a role already at the level of illness reporting, before the individual is even confronted with decision-making on seeking care \[35\]. Deeper understanding is essential to inform future policies and interventions. In line with prior studies from Bangladesh \[34\], we found higher health expenditure (CNCD-related expenditure in this study) among the elderly (60 years old and above). This finding is not surprising, since, consistent with economic theory \[36\], one would expect the need for medication to increase with age as health deteriorates. However, the finding is worrisome since it points at the potential for the elderly, i.e., those most in need, to forgo care owing to the fear of incurring high costs. Further qualitative inquiry is needed to clarify the role of age in mediating decisions concerning health-care seeking and specifically health spending.

The fact that individuals suffering from major CNCDs were more likely to seek qualified care and incur higher expenditure is likely a reflection of existing health system structures and policies \[15\], and emphasizes these conditions as the ones incurring the highest burden in the country. Additionally, given the importance that major CNCDs receive in the national discourse on CNCDs \[15, 32\], it is likely that cases of individuals affected by major CNCDs generate a higher degree of perceived severity \[21\] than do cases of minor CNCDs. As our study did not include a measure of perceived severity, qualitative inquiry is required to explore this issue further.

Our findings echo prior results from low-resource settings, showing that the chances of seeking qualified care decrease as the proportion of household members suffering from CNCDs increases \[21\]. This is likely the consequence of decisions on intra-household resource allocation, with heavily affected households having to ration health spending to avoid asset depletion \[21, 28\]. In line with prior evidence from Bangladesh \[9, 22\], appraising these findings jointly with findings indicating a higher propensity to use qualified care among the least poor, and with findings suggesting the regressive nature of OOPE, points at the existing gaps in population coverage and financial protection. In turn, recognition of these gaps calls for the urgent introduction of measures to ensure equitable access and financial protection for affected households.

Our study also identified an increasing distance to the sub-district public referral facility, as well as urban residence as factors affecting the probability to seek qualified care. While the relation between formal service use and distance is self-explanatory and has been widely documented, the relationship between urban residence and health choices appears surprising and requires further investigation. Similarly, the differences observed across sub-districts can only be explained and understood through further qualitative inquiry. It is plausible to assume that the difference observed across rural and urban contexts and across sub-districts is the result of specific features in the local health system organization, which could not be captured in our survey.

| Variable and its measurement | No care or self-care (N = 139) | Semi-qualified professional care (N = 364) | Qualified professional care (N = 363) | Test statistics and P value |
|-----------------------------|-----------------------------|--------------------------------|--------------------------------|-----------------------------|
| **Contextual characteristics** |                             |                                 |                                |                             |
| Distance to the referral public health facility of the sub-district (km), mean (SD) | 4.82 (3.69) | 5.25 (3.64) | 4.59 (3.57) | F (2, 863) = 3.03, P = 0.05 |
| Rural or urban residence, n (%) | Rural | 54 (38.9) | 165 (45.3) | 145 (39.9) | \(\chi^2 = 2.85, df = 2, P = 0.24\) |
| Urban | 85 (61.2) | 199 (54.7) | 218 (60.1) |                             |
| Sub-district of residence, n (%) | Rangpur Sadar | 16 (11.5) | 25 (6.9) | 42 (11.6) | \(\chi^2 = 85.11, df = 8, P < 0.001\) |
| Mithapukur | 98 (70.5) | 232 (63.7) | 143 (39.4) |                             |
| Badarganj | 4 (2.9) | 8 (2.2) | 37 (10.2) |                             |
| Pirlganj | 5 (3.6) | 33 (9.1) | 71 (19.6) |                             |
| Pirlchacha | 16 (11.5) | 66 (18.1) | 70 (19.3) |                             |

CNCDs, chronic non-communicable diseases; F, F statistic; \(\chi^2\), chi-square value; df, degree of freedom; SD, standard deviation; km, kilometer

1 Test statistics and P values based on ANOVA for continuous variables
2 Test statistics and P values based on \(\chi^2\) tests (or Fisher exact tests) for categorical variables
### Table 5: Health-seeking behavior for CNCDs: estimated coefficients in multinomial logistic regression model

| Type of health seeking | No care or self-care vs. qualified professional care | Semi-qualified pr. care vs. qualified professional care |
|------------------------|-----------------------------------------------------|-------------------------------------------------------|
|                        | \( \beta \) coefficient | 95% CI | \( P \) value | \( \beta \) coefficient | 95% CI | \( P \) value |
| Intercept              | -1.878 | -3.92, 0.16 | 0.07 | -2.791 | -4.39, -1.19 | 0.001 |
| Individual characteristics |                     |          |          |                     |          |          |
| Primary level education and above (reference group: no schooling) | -0.624 | -1.07, -0.17 | 0.007 | -0.187 | -0.53, 0.15 | 0.28 |
| Have major CNCD (reference group: have minor CNCD) | -0.523 | -1.01, -0.04 | 0.03 | -0.665 | -1.02, -0.31 | <0.001 |
| Household characteristics |                     |          |          |                     |          |          |
| Proportion of CNCD patients in household | 1.561 | 0.64, 2.49 | 0.001 | 1.522 | 0.78, 2.27 | <0.001 |
| Asset quintile (reference group: 1st quintile) |                     |          |          |                     |          |          |
| 2nd quintile | -0.794 | -1.50, -0.09 | 0.03 | -0.893 | -1.44, -0.35 | 0.001 |
| 3rd quintile | -0.841 | -1.57, -0.12 | 0.02 | -0.872 | -1.43, -0.31 | 0.002 |
| 4th quintile | -0.498 | -1.19, 0.19 | 0.16 | -0.783 | -1.33, -0.23 | 0.005 |
| 5th quintile (least poor) | -0.627 | -1.33, 0.08 | 0.08 | -0.987 | -1.54, -0.43 | <0.001 |
| Presence of acute illness in household (reference group: no acute illness in household) | -0.468 | -1.02, 0.08 | 0.10 | 0.308 | 0.12, 0.74 | 0.16 |
| Contextual characteristics |                     |          |          |                     |          |          |
| Distance to sub-district’s public referral health facility | 0.140 | -0.03, 0.31 | 0.11 | 0.232 | 0.10, 0.36 | <0.001 |
| Type of residence (reference group: rural) |                     |          |          |                     |          |          |
| Urban | 0.951 | -0.23, 2.13 | 0.11 | 1.297 | 0.39, 2.21 | 0.005 |
| Sub-district of residence (reference group: Rangpur Sadar) |                     |          |          |                     |          |          |
| Mithapukur | 1.040 | 0.25, 1.83 | 0.01 | 1.458 | 0.80, 2.12 | <0.001 |
| Badarganj | -0.393 | -1.91, 1.03 | 0.59 | 0.623 | -0.48, 1.73 | 0.27 |
| Pirganj | -1.166 | -2.35, 0.02 | 0.05 | 0.637 | -0.13, 1.40 | 0.10 |
| Pirgacha | 0.112 | -0.85, 1.07 | 0.82 | 1.457 | 0.71, 2.20 | <0.001 |

Multinomial logistic regression model specifications:

- Pseudo \( R^2 = 0.1028 \)
- \( X^2 (28) = 182.04, P > X^2 = 0.0000 \)
- Hausman tests of IIA assumption
  - \( X^2 (15) = 14.71 \) (omitted semi-qualified care), \( P > X^2 = 0.473 \)
  - \( X^2 (15) = 10.37 \) (omitted no/self-care), \( P > X^2 = 0.796 \)
- Small-Hsiao tests of IIA assumption
  - \( X^2 (15) = 12.35 \) (omitted semi-qualified care), \( P > X^2 = 0.863 \)
  - \( X^2 (15) = 9.27 \) (omitted no/self-care), \( P > X^2 = 0.052 \)

CNCDs, chronic non-communicable diseases; pr., professional; CI, confidence interval; IIA, independence of irrelevant alternatives

\(^1\)We considered qualified professional care seekers as reference category for multinomial logistic regression
| Variable and sub-category | Total direct OOPE (N = 754) | Expenditure on drugs (N = 728) |
|--------------------------|-----------------------------|-------------------------------|
|                          | 5% trimmed Mean | Median (min-max) | 5% trimmed Mean | Median (min-max) |
| Type of care sought      |                             |                             |                             |                             |
| No care or self-care     | 466.2 (10–4050) | 200 | 372.8 (10–3000) | 175 |
| Semi-qualified care      | 765.9 (30–5000) | 350 | 535.1 (30–3000) | 300 |
| Qualified care           | 3224.6 (200–18000) | 2000 | 1811.3 (50–11000) | 1000 |
| Age                      |                             |                             |                             |                             |
| Productive-age group (15 < 60 years) | 1647.5 (50–10500) | 800 | 961.6 (40–6000) | 500 |
| Elderly (≥ 60 years)     | 2495.4 (30–23300) | 1000 | 1727.9 (50–20000) | 500 |
| Sex                      |                             |                             |                             |                             |
| Male                     | 1753.3 (50–12000) | 750 | 1018.8 (50–5000) | 500 |
| Female                   | 1787.3 (40–13000) | 825 | 1092.0 (40–8000) | 500 |
| Education                |                             |                             |                             |                             |
| No schooling             | 1538.3 (30–10880) | 630 | 1062.9 (30–8900) | 500 |
| Primary education and above | 1969.6 (60–13000) | 975 | 1066.5 (50–6000) | 500 |
| Status of occupation     |                             |                             |                             |                             |
| Not income generating    | 2012.6 (50–14450) | 885 | 1192.0 (50–5000) | 500 |
| Income generating        | 1525.4 (50–8000) | 700 | 931.0 (40–8000) | 500 |
| Being household head     |                             |                             |                             |                             |
| No                       | 1847.1 (50–13005) | 910 | 1122.5 (45–8000) | 500 |
| Yes                      | 1652.3 (50–10500) | 700 | 993.3 (40–5000) | 500 |
| Type of CNCD             |                             |                             |                             |                             |
| Major CNCD               | 2313.4 (100–2000) | 1250 | 1343.4 (100–7000) | 600 |
| Minor CNCD               | 1453.3 (40–13000) | 550 | 888.1 (30–8000) | 400 |
| Asset quintile           |                             |                             |                             |                             |
| 1st quintile (poorest)   | 1722.9 (30–15000) | 550 | 1000.7 (30–10000) | 500 |
| 2nd quintile             | 1318.5 (50–7200) | 700 | 893.4 (50–5000) | 500 |
| 3rd quintile             | 1749.6 (30–9000) | 850 | 1075.2 (30–6000) | 500 |
| 4th quintile             | 1373.4 (40–8000) | 700 | 861.6 (35–5000) | 500 |
| 5th quintile (least poor)| 2690.3 (90–16000) | 1500 | 1494.0 (60–10000) | 600 |
| Type of residence        |                             |                             |                             |                             |
| Rural                    | 2080.9 (75–13000) | 1000 | 1218.5 (50–8000) | 600 |
| Urban                    | 1542.2 (30–12000) | 700 | 945.2 (40–7000) | 500 |
| Sub-district of residence|                             |                             |                             |                             |
| Rangpur Sadar            | 2211.9 (50–15000) | 1160 | 1465.2 (50–8000) | 775 |
| Mithapukur               | 1034.3 (30–8000) | 400 | 626.5 (30–4000) | 300 |
| Badarganj                | 3537.7 (400–20000) | 2350 | 1633.0 (200–10000) | 900 |
| Pirgaj                     | 1941.2 (120–10120) | 1111.5 | 1206.9 (100–5000) | 500 |
| Pirkacha                  | 3539.5 (25–20000) | 2100 | 2311.4 (100–15000) | 1200 |

OOPE, out-of-pocket expenditure; CNCD, chronic non-communicable disease; BDT, Bangladeshi Taka

1Total OOPE consists of expenditure for consultation fee, drugs, diagnostics, informal pay and transport cost. The expenditure is shown in Bangladeshi taka (BDT).
2Exchange rate of data collection period (June–July, 2013), 1 USD~78 BDT
3Not all CNCD respondents incurred expenditure or reported on it. We found 754 respondents out of 866 who reported about OOPE
4We show expenditure for drugs besides total OOPE, because it constituted the largest component (85%) of total OOPE. The expenditure is shown in Bangladeshi taka (BDT).
5Most respondents reported a lump-sum OOPE and had difficulty recalling cost breakdowns. This is the reason we have fewer observations for expenditure on drugs compared to observations of total OOPE
6We observed skewed distribution of OOPE. Therefore, we reported a 5% trimmed mean
7We observed skewed distribution of OOPE. Therefore, we reported a 5% trimmed range (minimum-maximum)
8We observed skewed distribution of drug costs. Therefore, we reported a 5% trimmed range (minimum-maximum)
9Median of all OOPE observations (754 observations)
10We observed skewed distribution of expenditure on medications. Therefore, we reported a 5% trimmed mean
11We observed skewed distribution of drug costs. Therefore, we reported a 5% trimmed range (minimum-maximum)
12Median of all observations that reported on drug expenditure (728 observations)
Conclusions

In a context where primary government facilities do not offer CNCD care [8], care seeking for CNCD remains problematic. Our study clearly identifies some key challenges and, in doing so, points to the urgent need to fill the policy-implementation gap.

Abbreviations

ANOVA: Analysis of variance; CNCDs: Chronic non-communicable diseases; COPD: Chronic obstructive pulmonary disease; GPS: Global position system; INDEPTH: International Network for the Demographic Evaluation of Populations and Their Health; LMICs: Low- and middle-income countries; MBBS: Bachelor of Medicine and Surgery; MNL: Multinomial logistic regression; OOP: Out-of-pocket expenditure; P: Principal component analysis; SDGs: Sustainable development goals; SS: Shasthyo Shebika; UHCs: Upazilla health complexes; WHO: World Health Organization

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Authors’ contributions

MS, MDA, and HIA were responsible for design of the study, within which the household survey used for our analysis was embedded, with MS being the principal investigator. MDA and FBR conducted the study protocol for the study presented in this paper, with support from OK and MS. FBR conducted the analysis, with support from OK and MDA. FBR drafted the manuscript. All authors provided substantial critical inputs to finalize the manuscript. All authors read and approved the final version of the manuscript.

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Availability of data and materials

The data used for this study are not publicly available. Data can be requested from BRAC JPG School of Public Health, BRAC University, but restrictions may apply. Requests should be directed to Prof. Malabika Sarker, Professor, Director Research and Associate Dean, BRAC JPG School of Public Health, BRAC University.

Ethics approval and consent to participate

The Ethical Review Committee of the BRAC JPG School of Public Health, BRAC University reviewed and approved the study protocol shortly before data collection began in 2013. Interviewers obtained written informed consent from all respondents before interview.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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