Perceived Morbidity, Healthcare-Seeking Behavior and Their Determinants in a Poor-Resource Setting: Observation from India

Suman Kanungo¹, Kalyan Bhowmik¹, Tanmay Mahapatra¹, Sanchita Mahapatra¹, Uchhal K. Bhadra², Kamalesh Sarkar¹*

¹ National Institute of Cholera and Enteric Diseases, Kolkata, 700010, West Bengal, India, ² Medical College, Malda, 732101, West Bengal, India

* kamalesh.sarkar@gmail.com

Abstract

Background

To control the double burden of communicable and non-communicable diseases (NCDs), in the developing world, understanding the patterns of morbidity and healthcare-seeking is critical. The objective of this cross-sectional study was to determine the distribution, predictors and inter-relationship of perceived morbidity and related healthcare-seeking behavior in a poor-resource setting.

Methods

Between October 2013 and July 2014, 43999 consenting subjects were recruited from 10107 households in Malda district of West Bengal state in India, through multistage random sampling, using probability proportional-to-size. Information on socio-demographics, behaviors, recent ailments, perceived severity and healthcare-seeking were analyzed in SAS-9.3.2.

Results

Recent illnesses were reported by 55.91% (n=24600) participants. Among diagnosed ailments (n=23626), 50.92% (n=12031) were NCDs. Respiratory (17.28%,n=7605)), gastrointestinal (13.48%,n=5929) and musculoskeletal (6.25%,n=2749) problems were predominant. Non-qualified practitioners treated 53.16% (n=13074) episodes. Older children/adolescents [adjusted odds ratio for private healthcare providers(AORPri)=0.76, 95% confidence interval=0.71-0.83] and for Govt. healthcare provider(AORGovt)=0.80(0.68-0.95)], females [AORGovt=0.80(0.73-0.88)], Muslims [AORPri=0.85(0.69-0.76) and AOR-Govt=0.92(0.87-0.96)], backward castes [AOR-Govt=0.93(0.91-0.96)] and rural residents [AORpri=0.82(0.75-0.89) and AORGovt=0.72(0.64-0.81)] had lower odds of visiting qualified practitioners. Apparently less severe NCDs [acid-peptic disorders: AORPri=0.41(0.37-0.46) & AORGovt=0.41(0.37-0.46), osteoarthritis: AORPri=0.72(0.59-0.68) & AORGovt=0.58(0.43-0.78)], gastrointestinal [AORPri=0.28(0.24-0.33) & AORGovt=0.69(0.58-0.81)], respiratory [AORPri=0.35(0.32-0.39) & AORGovt=0.46(0.41-0.52)] and skin infections [AORPri=0.65

Citation: Kanungo S, Bhowmik K, Mahapatra T, Mahapatra S, Bhadra UK, Sarkar K (2015) Perceived Morbidity, Healthcare-Seeking Behavior and Their Determinants in a Poor-Resource Setting: Observation from India. PLoS ONE 10(5): e0125865. doi:10.1371/journal.pone.0125865

Academic Editor: Hemachandra Reddy, Texas Tech University Health Science Centers, UNITED STATES

Received: November 23, 2014
Accepted: March 25, 2015
Published: May 12, 2015

Copyright: © 2015 Kanungo et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: Due to ethical restrictions, data are available upon request. Interested researchers may submit requests for data to Dr. Kamalesh Sarkar (the Corresponding Author) for confidential data preserved under the supervision of the Institutional Ethics Committees of the National Institute of Cholera and Enteric Diseases, Kolkata, India. Further, contact details of the Member Secretary, Institutional Ethics Committee of National Institute of Cholera and Enteric Diseases, Kolkata, India: Dr. Phalguni Dutta, Institutional Ethics Committee, National Institute of Cholera and Enteric
Better education [AOR$_{Pri}$=1.91(1.65-2.22) for ≥graduation], sanitation [AOR$_{Pri}$=1.58(1.42-1.75)] and access to safe water [AOR$_{Pri}$=1.33(1.05-1.67)] were associated with healthcare-seeking from qualified private practitioners. Longstanding NCDs [chronic obstructive pulmonary diseases: AOR$_{Pri}$=1.80(1.46-2.23), hypertension: AOR$_{Pri}$=1.94(1.60-2.36), diabetes: AOR$_{Pri}$=4.94 (3.55-6.87)] and serious infections [typhoid: AOR$_{Pri}$=2.86(2.04-4.03)] were also more commonly treated by qualified private practitioners. Potential limitations included temporal ambiguity, reverse causation, generalizability issues and misclassification.

Conclusion

In this poor-resource setting with high morbidity, ailments and their perceived severity were important predictors for healthcare-seeking. Interventions to improve awareness and healthcare-seeking among under-privileged and vulnerable population with efforts to improve the knowledge and practice of non-qualified practitioners probably required urgently.

Introduction

Demographic ageing, unplanned urbanization and unhealthy lifestyles are the major contributors for the changing pattern of disease in recent years, from communicable to non-communicable diseases (NCDs), globally.[1–3] This epidemiological transition is spreading fast in the developing world, progressively affecting poor, vulnerable and disadvantaged populations.[3,4] Nearly 80% of the current burden of NCDs like cardio-vascular disease, diabetes, cancer and chronic respiratory diseases occurred in low and middle-income countries (LMIC), accounting for 90% of premature (< 60 years) deaths.[1,4,5] As major fraction of this global burden of disease was attributed to preventable risk factors, known behavioral and medical interventions could prevent about 80% of these premature deaths.[3,6] In this era of changing epidemiological trend, the scenario is worsening gradually in LMICs including India where increasing mortality and morbidity are attributable to double burden of communicable and non-communicable diseases in poor-resource settings.[7–9]

Despite remarkable progress in socio-economic development and having an overarching aim of addressing the health needs through several comprehensive programs, health outcomes in India remained poor. During 2012, approximately 60% deaths were attributed to NCDs (cardiovascular diseases = 26%, chronic respiratory diseases = 13%, cancers = 7%, diabetes = 2% & injuries = 12%) and 28% to communicable, maternal, perinatal and nutritional conditions in this country.[10,11] Evidences suggested that healthcare infrastructure, service delivery system and health outcomes varied considerably across Indian states and for efficient improvement of these parameters, understanding the morbidity patterns and their predictors seemed to be required urgently.[12] It has also been established in recent past that self-perceived morbidity is a reliable measure for estimating the burden especially in a poor-resource setting.[13–16]

Individual healthcare-seeking pattern in a community is determined by complex interrelationships between socio-economic and physical environment along with individual characteristics and behaviors.[17] Thus healthcare-seeking pattern and related outcomes have been the focus of community level improvement of health systems worldwide and India is no exception. In last few years, studies have shown that household information based on door-to-door visits were useful for the identification of gaps in perceived morbidity and resultant healthcare-
seeking in both urban and rural areas.\textsuperscript{[18,19]} Diverse healthcare-seeking patterns, especially involving non-qualified practitioners and pharmacists often resulted in inadequate treatment, improper dosing and over-the-counter purchase of drugs, frequently culminating into development of antimicrobial resistance and other unfavorable outcomes.\textsuperscript{[20–22]}

Relevant researches on morbidity and healthcare-seeking ever conducted in India were mostly limited to urban areas of southern and western part while eastern region remained largely understudied.\textsuperscript{[23]} Malda is one of the poorest districts, situated in the north-eastern part of the state of West Bengal, India; sharing interstate borders with Bihar and Jharkhand, and international border with Bangladesh. Thus international and interstate migration resulted in uneven demographic pressures on the healthcare infrastructure that had to cater 1,870 populations per hospital bed.\textsuperscript{[24]} The district health situation urgently demanded appropriately targeted public health interventions for mitigation of gaps and up-gradation of the healthcare infrastructure to achieve proper control of communicable and non-communicable diseases. For this purpose, proper understanding of the perceived morbidity, related healthcare-seeking and their predictors among residents of this district seemed to be the need of the hour.

Hence, a community-based cross-sectional study was designed involving a representative population of Malda to understand the distribution of the perceived morbidity and healthcare-seeking behavior, their predictors and inter-relationship.

**Methods**

**Ethics Statement**

The study protocol was reviewed and approved by the Ethics Committee of the National Institute of Cholera and Enteric Diseases, Kolkata. Written informed consent left thumb impression (for illiterates, in presence of two impartial literate witnesses) was obtained from residents older than 18 years and from the guardians of residents aged 1 to 17 years. Written assent was additionally obtained from residents aged 12 to 17 years.

**Recruitment**

Based on the 2011 census data, the urban area of the Malda district was divided into two broad urban administrative divisions termed as Municipalities (Old Malda and English Bazar). Each Municipality was further subdivided into smaller administrative units called Wards (19 in Old Malda and 25 in English Bazar). Using probability proportional to size (PPS) determined by the total number of households in the Wards, 4 Wards in Old Malda and 12 Wards in English Bazar were selected randomly. The rural area of the district consisted of 3701 villages and 27 rural towns from which similarly using PPS, 25 villages/census towns were selected randomly. Using an exhaustive house-list of the urban and rural areas, each selected municipal ward and village/rural town was categorized into several segments (considered as Primary Sampling Unit: PSU), each having 125 households (defined as those who shared the cooking-pot in each dwelling). Next, 4012 urban and 6095 rural households (maintaining the population ratio) were selected from the whole district, through multistage random sampling, using PPS. Thus, 16 municipal wards in urban and 24 villages/towns in rural area were selected. In each selected ward/village from the list of segments two were selected randomly and all households were surveyed there after collecting written informed consent from the residents.

**Interview**

All the individuals residing in the selected households were interviewed at home by trained interviewers, using a structured, pre-tested, bi-lingual (English and local language: Bengali)
questionnaire. Information was collected on socio-demographic and related variables such as age, gender, religion, caste, education level and occupation of the household members, maximum education level among adults in the house, house ownership, residential area, type and location of water source, water treatment at home, material used for cooking and domestic light source. Housing type was classified as Kachha (if neither roof/walls/floors was made of permanent materials like bricks/cement/stone), Pacca (if roof, walls and floors all were made of permanent materials like bricks/cement/stone) and Semi-pacca (for any combinations between Kaccha and Pacca builds regarding roof, walls and floors). Sanitation level of toilet use practices were categorized as poor (if the household had no toilet and the members used open space/field/jungle for defecation), good (for households having toilets with flush to piped sewer system/flush to septic tank) and all others (flush to pit latrine/flush to elsewhere/all other types of pit latrine etc.) as average.

Based on the information regarding household assets (enquired using an appropriate list of assets), number of cattle, goats/sheep, poultry, place for keeping them and the aforementioned household information, wealth index was calculated by using relative weights for each and then the cumulative wealth index scores were log-transformed and divided into quintiles of socio-economic status: SES (very poor, poor, lower middle, upper middle and upper) based on the percentile distribution.

For all the members of the selected households, information regarding last three episodes of ailments that forced them to seek some healthcare services within last two months was collected. Occurrence, perceived severity and healthcare-seeking behavior (visited non-qualified/qualified private sector/qualified Govt. sector practitioners) regarding specific NCDs like: acid peptic disorder (APD) or peptic ulcer disorder (PUD), chronic obstructive pulmonary disease (COPD), hypertension (HTN), diabetes mellitus (DM), anemia and osteoarthritis (OA) as well as communicable diseases like: gastroenteritis, respiratory tract infection (RTI), typhoid and skin infections were also collected.

Data analyses
Thus between October 2013 and July 2014, 43999 individuals (with approximately 8% non-response) were recruited from 10107 households (4012 urban and 6095 rural) and collected data were analyzed using Statistical Analysis System (SAS) version 9.3.2. Distribution of the socio-demographic characteristics, morbidity pattern and healthcare-seeking were determined by conducting descriptive analyses using survey frequency procedure to determine overall and stratified frequencies, proportions and corresponding 95% confidence intervals (95%CI). Bivariate and multivariate logistic regression analyses were next conducted to determine unadjusted (OR) and adjusted (for age, gender, religion, caste, individual and familial education, occupational type, residential area, sanitation and SES) odds ratios (AOR) as the measures of association (with corresponding 95%CIs) between study variables. Multinomial logistic regressions [25] were used where the dependent variables had more than two categories.

Results
Among 43999 subjects, majorities were aged 18–40 yrs (40.74%, n = 17925), male (50.65%, n = 22287), Hindu (67.89%, n = 29869), general caste (42.11%, n = 18526) and educated up to secondary level (33.44%, n = 12782). For 38.82% (n = 17080) Maximum adult education in the household was also up to secondary level, 95.73% (n = 42122) stayed in own house, 39.60% (n = 15888) were in sedentary work and 62.60% (n = 27543) lived in rural areas. (Table 1)

Only 5.31% (n = 2336) were drinking safe water, 50.32% (n = 22140) had to bring drinking water from outside, 95.06% (n = 41825) were not doing any water treatment at home, 29.08%
Table 1. Overall and stratified (across the strata of health-seeking behavior) distribution of socio-demographic characteristics among recruited residents of Malda, West Bengal, India (N = 43999).

| Socio-demographics | Total (N = 43999) | Did not report any recent morbidity (n = 14940) | Reported to have recent morbidity & took care sought from (Qualifed Govt. sector (n = 9869)) | Reported to have recent morbidity & private sought from (Qualifed Govt. type (n = 13074)) |
|---------------------|------------------|-----------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Gender              |                  |                                              |                                                                                        |                                                                                        |
| Male                | 2247             | 51.57(50.78-52.37)                           | 2471                                                                                   | 55.86(55.03-56.69)                                                                    |
| Female              | 2143             | 49.43(48.63-50.24)                           | 2308                                                                                   | 45.41(44.72-46.11)                                                                    |
| Religion            |                  |                                              |                                                                                        |                                                                                        |
| Hindu               | 29869            | 67.89(67.45-68.33)                           | 32466                                                                                  | 72.11(71.52-72.70)                                                                    |
| Muslim              | 13975            | 31.76(31.33-32.19)                           | 15454                                                                                  | 33.85(33.35-34.35)                                                                    |
| Christian           | 144              | 0.33(0.27-0.38)                              | 170                                                                                     | 0.38(0.32-0.44)                                                                       |
| Others              | 456              | 1.04(0.94-1.15)                              | 528                                                                                     | 1.15(1.06-1.24)                                                                       |
| Age group of the subject |              |                                              |                                                                                        |                                                                                        |
| <5 years            | 4373             | 9.80(9.54-9.97)                              | 4792                                                                                   | 10.66(10.37-10.95)                                                                    |
| 5–18 years          | 12043            | 27.37(26.84-27.90)                           | 13255                                                                                  | 29.41(28.91-30.91)                                                                    |
| 18–40 years         | 17925            | 40.74(40.26-41.22)                           | 19275                                                                                  | 39.94(39.44-40.43)                                                                    |
| ≥41 years           | 9576             | 22.12(21.65-22.59)                           | 10227                                                                                  | 21.02(20.52-21.53)                                                                    |
| Education level of the subject |            |                                              |                                                                                        |                                                                                        |
| Illiterate          | 15904            | 36.31(35.98-36.73)                           | 17804                                                                                  | 37.85(37.36-38.33)                                                                    |
| Higher-secondary    | 2086             | 5.46(5.23-5.71)                              | 2266                                                                                   | 5.96(5.72-6.20)                                                                       |
| Tertiary            | 6248             | 14.22(13.88-14.56)                           | 7014                                                                                   | 14.75(14.31-15.19)                                                                    |
| Luxembourg          | 456              | 1.04(0.94-1.15)                              | 528                                                                                     | 1.15(1.06-1.24)                                                                       |
| Others              | 456              | 1.04(0.94-1.15)                              | 528                                                                                     | 1.15(1.06-1.24)                                                                       |
| Education level among adult members of the household |            |                                              |                                                                                        |                                                                                        |
| Illiterate          | 15904            | 36.31(35.98-36.73)                           | 17804                                                                                  | 37.85(37.36-38.33)                                                                    |
| Higher-secondary    | 2086             | 5.46(5.23-5.71)                              | 2266                                                                                   | 5.96(5.72-6.20)                                                                       |
| Tertiary            | 6248             | 14.22(13.88-14.56)                           | 7014                                                                                   | 14.75(14.31-15.19)                                                                    |
| Luxembourg          | 456              | 1.04(0.94-1.15)                              | 528                                                                                     | 1.15(1.06-1.24)                                                                       |
| Others              | 456              | 1.04(0.94-1.15)                              | 528                                                                                     | 1.15(1.06-1.24)                                                                       |
| House ownership     |                  |                                              |                                                                                        |                                                                                        |
| In own dwelling     | 3785             | 86.93(86.46-87.40)                           | 4091                                                                                   | 91.19(90.67-91.70)                                                                    |
| In rented house     | 353             | 8.03(7.70-8.36)                              | 386                                                                                     | 9.09(8.62-9.56)                                                                       |
| Others              | 353             | 8.03(7.70-8.36)                              | 386                                                                                     | 9.09(8.62-9.56)                                                                       |
| Occupation type     |                  |                                              |                                                                                        |                                                                                        |
| White collar        | 1289             | 29.65(29.25-30.05)                           | 1337                                                                                   | 30.54(30.03-30.95)                                                                    |
| Blue collar         | 1092             | 25.14(24.71-25.57)                           | 1146                                                                                   | 26.15(25.63-26.69)                                                                    |
| Others              | 1092             | 25.14(24.71-25.57)                           | 1146                                                                                   | 26.15(25.63-26.69)                                                                    |
| Water Source        |                  |                                              |                                                                                        |                                                                                        |
| May be unsafe       | 40208            | 91.38(91.12-91.64)                           | 43392                                                                                  | 94.08(93.78-94.38)                                                                    |
| Uncertain           | 1571             | 3.61(3.36-3.85)                              | 1713                                                                                   | 3.67(3.40-3.95)                                                                       |
| In own well         | 1000             | 2.31(2.10-2.53)                              | 1125                                                                                   | 2.37(2.15-2.60)                                                                       |
| Source of water     |                  |                                              |                                                                                        |                                                                                        |
| Ground water        | 1264             | 28.97(28.52-29.42)                           | 1333                                                                                   | 29.72(29.22-30.22)                                                                    |
| Urban               | 1000             | 2.31(2.10-2.53)                              | 1125                                                                                   | 2.37(2.15-2.60)                                                                       |
| Rural               | 3785             | 86.93(86.46-87.40)                           | 4091                                                                                   | 91.19(90.67-91.70)                                                                    |
| Total               | 43999            | 100.00(99.97-100.03)                          | 47127                                                                                  | 100.00(99.97-100.03)                                                                   |

Note: Values in parentheses represent 95% confidence intervals.
| Socio-demographics | Categories | Total (N = 43999) | Didn’t report any recent morbidity (n = 19404) | Reported to have recent morbidity & care sought from (Practitioner type) |
|-------------------|------------|-------------------|-----------------------------------------------|--------------------------------------------------|
|                   |            | Percentage (95%CI) | Percentage (95%CI)                           | Non-qualified (13074) | Percentage (95%CI) | n | Percentage (95%CI) | Qualified, private sector (8368) | Percentage (95%CI) | Qualified, Govt. sector (3153) | Percentage (95%CI) |
|                   | n          |                   |                   |                                           | n | Percentage (95%CI) | n | Percentage (95%CI) |                                           | n | Percentage (95%CI) |                                           |
|                   | 41825      | 95.06 (94.86–95.26) | 18391 94.78 (94.47–95.09) | 12689 97.06 (96.77–97.35) | 7719 92.24 (91.67–92.82) | 3026 95.97 (95.29–96.66) |
|                   | 2174       | 4.94 (4.74–5.14)   | 1013 5.22 (4.91–5.53)   | 385 2.94 (2.66–3.23)   | 649 7.76 (7.18–8.33)   | 127 4.03 (3.34–4.71)   |
|                   | 11856      | 26.95 (26.53–27.36) | 5133 26.45 (25.83–27.07) | 4282 32.75 (31.95–33.56) | 1523 18.20 (17.37–19.03) | 918 29.12 (27.53–30.70) |
|                   | 18668      | 42.43 (41.97–42.89) | 8287 42.71 (42.01–43.40) | 5634 43.09 (42.24–43.94) | 3338 39.89 (38.84–40.94) | 1409 44.69 (42.95–46.42) |
|                   | 13475      | 30.63 (30.20–31.06) | 5984 30.84 (30.19–31.49) | 3158 24.15 (23.42–24.89) | 3507 41.91 (40.85–42.97) | 826 26.20 (24.66–27.73) |
|                   | 13441      | 30.55 (30.12–30.99) | 6084 31.36 (30.71–32.01) | 4610 35.27 (34.45–36.09) | 1900 22.71 (21.81–23.61) | 847 26.86 (25.32–28.41) |
|                   | 17376      | 39.50 (39.04–39.96) | 7624 39.30 (38.61–39.99) | 5525 42.27 (41.42–43.12) | 2758 32.97 (31.96–33.97) | 1469 46.59 (44.85–48.33) |
|                   | 379        | 0.86 (0.78–0.95)   | 156 0.80 (0.68–0.93)    | 120 0.92 (0.75–1.08)    | 73 0.87 (0.76–0.97)     | 30 0.95 (0.61–1.29)    |
|                   | 12794      | 29.08 (28.66–29.51) | 5536 28.54 (27.90–29.17) | 2816 21.54 (20.84–22.25) | 3635 43.45 (42.39–44.51) | 807 25.59 (24.07–27.12) |
|                   | 15377      | 34.97 (34.52–35.41) | 6808 35.10 (34.43–35.78) | 5260 40.26 (39.42–41.10) | 2114 25.28 (24.34–26.21) | 1195 37.90 (36.21–39.59) |
|                   | 16639      | 37.84 (37.38–38.29) | 7152 36.86 (36.20–37.56) | 5133 39.29 (38.45–40.12) | 3023 36.14 (35.11–37.17) | 1331 42.21 (40.49–44.94) |
|                   | 11961      | 27.20 (26.78–27.61) | 5434 28.02 (27.39–28.65) | 2673 20.46 (19.77–21.15) | 3227 38.58 (37.54–39.63) | 627 18.89 (18.49–21.28) |
|                   | 62         | 0.14 (0.11–0.18)   | 26 0.13 (0.08–0.19)     | 20 0.15 (0.09–0.22)     | 8 0.10 (0.05–0.16)      | 8 0.25 (0.08–0.43)     |
|                   | 4802       | 10.92 (10.62–11.21) | 2032 10.47 (10.04–10.90) | 1754 13.42 (12.83–14.00) | 585 6.99 (6.44–7.54)    | 431 13.67 (12.47–14.87) |
|                   | 32         | 0.07 (0.05–0.10)   | 14 0.07 (0.03–0.11)     | 9 0.07 (0.02–0.11)      | 7 0.08 (0.02–0.15)      | 2 0.06 (0.00–0.15)     |
|                   | 39098      | 88.87 (88.58–89.17) | 17330 89.32 (88.89–89.76) | 11288 86.36 (85.77–86.95) | 7768 92.83 (92.28–93.38) | 2712 86.01 (84.80–87.22) |
|                   | 9186       | 20.88 (20.50–21.26) | 3657 18.85 (18.30–19.40) | 3452 26.40 (25.65–27.16) | 1288 15.39 (14.62–16.17) | 789 25.02 (23.51–26.54) |
|                   | 10157      | 23.08 (22.69–23.48) | 4216 21.73 (21.15–22.31) | 3085 23.60 (22.96–24.32) | 2022 24.16 (23.25–25.08) | 634 26.45 (24.91–27.99) |
|                   | 7065       | 16.06 (15.71–16.40) | 3112 16.04 (15.52–16.55) | 1948 14.90 (14.29–15.51) | 1513 18.08 (17.26–18.91) | 492 15.60 (14.34–16.87) |
|                   | 9038       | 20.54 (20.16–20.92) | 4182 21.55 (20.97–22.13) | 2338 17.88 (17.23–18.54) | 1991 23.79 (22.88–24.71) | 527 16.71 (15.41–18.02) |
|                   | 8553       | 19.44 (19.07–19.81) | 4237 21.84 (21.25–22.42) | 2251 17.22 (16.57–17.86) | 1554 18.57 (17.74–19.40) | 511 16.21 (14.92–17.49) |

n = Stratum specific number of participants; 95%CI = 95% Confidence Interval

doi:10.1371/journal.pone.0125865.t001
(n = 12794) were using gas/electricity for cooking. 27.20% (n = 11961) were living in pacco houses. Electricity was the source of lighting at home for 88.87% (n = 39098), regarding toilet use 30.63% (n = 13475) had good sanitary practices and overall 19.44% (n = 8553) belonged to upper SES. Overall and stratified (across healthcare-seeking patterns) socio-demographic distribution are presented in Table 1.

Regarding the distribution of self-perceived most recent (within past 2 month) morbidity, 44.09% (n = 19399) did not suffer from any such recently while for 17.28% (n = 7605), 13.48% (n = 5929) and 6.25% (n = 2749) residents the most recent morbidity was related to respiratory, gastrointestinal and musculoskeletal system respectively. Among the most recent ailments, NCDs were 50.92% (n = 12031), 53.16% (n = 13074) episodes were treated by non-qualified practitioners, 34.02% (n = 8368) by qualified practitioner from private sector and only 12.82% (n = 3153) by qualified practitioner from Govt. sector. Non-qualified practitioners were treating more communicable diseases compared to NCDs [57.52% (n = 7194) vs. 42.48% (n = 5313)]. (Table 2)

Based on last three healthcare-seeking episodes, among specific ailments (suffered or not), 19.01% (n = 6734) suffered from RTI, 8.18% (n = 2554) had PUD/APD, 6.45% (n = 1977) experienced gastroenteritis while 3.60% (n = 1070) had some skin problems. Among subjects visiting nonqualified practitioners, only 16.85% (n = 1551) perceived their ailments as severe while this fraction for private sector qualified practitioners, was 40.85% (n = 1829). (Table 2)

Association of socio-demographics with morbidity and healthcare-seeking are presented in Tables 3 and 4. Compared to illiterates, higher familial education was associated with lower likelihood of APD [AORGraduation = 0.54(0.43–0.67)] but more prone to typhoid [AORGraduation = 1.89(1.17–3.04)] but less vulnerable to COPD [AOR = 0.53(0.40–0.69)] and HTN [AOR = 0.60(0.46–0.77)]. Rural residents, compared to urban, were less likely to have HTN [AOR = 0.54(0.43–0.67)] but more prone to OA [AOR = 1.47(1.15–1.87)],
## Table 2. Overall and stratified (across the strata of health-seeking behavior) distribution of self-perceived morbidities among recruited residents of Malda, West Bengal, India (N = 43999).

| Type of morbidity | Communicable diseases | Non-communicable diseases | Treated by | Specific ailments (Based on last three episodes of ill-health) |
|-------------------|------------------------|---------------------------|------------|-------------------------------------------------------------|
|                   | 11595(49.08(48.44–49.71) | 5203(50.92(50.29–51.56) | 12031(50.92(50.29–51.56) | 360(3.38–3.81) |
|                   | 7194(57.52(56.65–58.39) | 3947(35.53–37.64) | 5313(42.48(41.61–43.35) | 508(6.36–64.47) |
|                   | 1452(47.47(45.70–49.24) | 1607(52.53(50.76–54.30) | 3153(12.82(12.40–13.24) | 31(0.15) |

### Distribution of all types of self-perceived morbidity * (based on most recent ailments)**

| Organ/System/Function involved | Total | Non-qualified | Qualified, private sector | Qualified, Govt. sector |
|-------------------------------|-------|--------------|--------------------------|------------------------|
| % | n | Percentage (95% CI) | % | n | Percentage (95% CI) | % | n | Percentage (95% CI) |
|-------------------------------|-------|--------------|--------------------------|------------------------|
| None | 19399 | 44.09(43.63–44.55) | 6734 | 19.01(18.60–19.42) | 4614 | 50.12(49.1–51.15) | 1552 | 34.67(33.27–36.06) | 568 | 34.76(32.45–37.07) |
| Respiratory | 7605 | 17.28(16.93–17.64) | 2031 | 24.27(23.35–25.19) | 814 | 25.82(24.29–27.35) | |
| Gastrointestinal | 5929 | 13.48(13.16–13.79) | 1763 | 21.07(20.19–21.94) | 749 | 23.76(22.27–25.24) | |
| Musculoskeletal | 2749 | 6.25(6.02–6.47) | 1451 | 11.10(10.56–11.64) | 966 | 11.54(10.86–12.23) | 332 | 10.53(9.48–11.6) | |
| Hematological/Immunological/Metabolic/Parasitic disorders | 1985 | 4.51(4.32–4.71) | 1102 | 8.43(7.95–8.91) | 587 | 7.01(6.47–7.56) | 295 | 9.36(8.34–10.37) | |
| Dermatological | 1419 | 3.23(3.06–3.39) | 731 | 5.59(5.20–5.99) | 463 | 5.53(5.04–6.02) | 223 | 7.07(6.18–7.97) | |
| Hypertension | 761 | 1.73(1.61–1.85) | 168 | 1.29(1.09–1.48) | 493 | 5.89(5.39–6.40) | 100 | 3.17(2.56–3.78) | |
| Neurological | 605 | 1.38(1.27–1.48) | 253 | 1.94(1.70–2.17) | 241 | 2.88(2.52–3.24) | 111 | 3.52(3.32–4.61) | |
| Eye/Nose/Throat related | 553 | 1.26(1.15–1.36) | 239 | 1.83(1.60–2.06) | 231 | 2.76(2.41–3.11) | 83 | 2.63(2.07–3.19) | |
| Reproductive | 552 | 1.25(1.15–1.36) | 221 | 1.69(1.47–1.91) | 265 | 3.17(2.79–3.54) | 66 | 2.09(1.59–2.59) | |
| Dental | 490 | 1.11(1.02–1.21) | 320 | 2.45(2.18–2.71) | 116 | 1.39(1.14–1.64) | 54 | 1.71(1.26–2.17) | |
| Ophthalmological | 476 | 1.08(0.99–1.18) | 83 | 0.63(0.50–0.77) | 293 | 3.50(3.11–3.90) | 100 | 3.17(2.56–3.78) | |
| Diabetes mellitus | 374 | 0.85(0.76–0.94) | 38 | 0.29(0.20–0.38) | 282 | 3.37(2.98–3.76) | 54 | 1.71(1.26–2.17) | |
| Urological | 267 | 0.61(0.53–0.68) | 37 | 0.28(0.19–0.37) | 189 | 2.26(1.94–2.58) | 41 | 1.30(0.90–1.70) | |
| Cardiovascular | 194 | 0.44(0.38–0.50) | 24 | 0.18(0.11–0.26) | 126 | 1.53(1.27–1.79) | 42 | 1.33(0.93–1.73) | |
| Thyroid disorders | 178 | 0.40(0.35–0.46) | 8 | 0.06(0.02–0.10) | 152 | 1.82(1.53–2.10) | 17 | 0.54(0.28–0.79) | |
| Cancer | 67 | 0.15(0.12–0.19) | 31 | 0.24(0.15–0.32) | 26 | 0.31(0.19–0.43) | 10 | 0.32(0.22–0.51) | |
| Injury/Bites | 53 | 0.12(0.09–0.15) | 12 | 0.09(0.04–0.14) | 13 | 0.16(0.07–0.24) | 28 | 0.89(0.56–1.22) | |
| Psychiatric | 50 | 0.11(0.08–0.15) | 4 | 0.03(0.00–0.06) | 40 | 0.48(0.33–0.63) | 6 | 0.19(0.04–0.34) | |
| Poisoning | 2 | <0.01(0.00–0.01) | - | - | - | - | 2 | 0.06(0.00–0.15) | |

* Non-qualified: Govt. sector

** Specific ailments (Based on last three episodes of ill-health)
| Variables                  | Categories                     | No. & Percentage of subjects who recently suffered | Treatment supervised by (Practitioner type) | Total |
|----------------------------|--------------------------------|--------------------------------------------------|--------------------------------------------|-------|
|                            |                                | n       | Percentage (95% CI) | n       | Percentage (95% CI) | n       | Percentage (95% CI) | n       | Percentage (95% CI) |
|                            |                                | Non-qual. |          | Non-qual. |          | Non-qual. |          | Non-qual. |          | Non-qual. |          |
|                            |                                |          |            |          |            |          |            |          |            |          |            |          |
|                            |                                |          |            |          |            |          |            |          |            |          |            |          |
| Perceived severity         | Easily recovered/Well controlled| 9589     | 62.61 (61.84–63.37) | 6493     | 70.54 (69.61–71.47) | 2146     | 47.93 (46.47–49.40) | 950     | 58.14 (55.75–60.53) |
|                            | Partially recovered/not fully controlled | 1860 | 12.14 (11.63–12.66) | 1161 | 12.61 (11.93–13.29) | 502 | 11.21 (10.29–12.14) | 197 | 12.06 (10.48–13.64) |
|                            | Not Recovered with initial treatment | 3867 | 25.25 (24.56–25.94) | 1551 | 16.85 (16.08–17.61) | 1829 | 40.85 (39.41–42.29) | 487 | 29.80 (27.58–32.02) |

n = Stratum specific number of participants; 95% CI = 95% Confidence Interval
* Excluding 291 undiagnosed and 683 “others”
** Group totals may not be identical due to missing values

doi:10.1371/journal.pone.0125865.t002
gastroenteritis [AOR = 1.76(1.50–2.07)], typhoid [AOR = 2.85(1.86–4.38)], RTI [AOR = 1.27 (1.16–1.38)] and skin infection [AOR = 1.45(1.19–1.77)].

Drinking safer water and practicing better sanitation regarding toilet use seemed to be associated with lower likelihood of suffering from gastroenteritis, typhoid, RTI and skin infections in bivariate analyses but the multivariate analyses lacked power. Relatively higher SES was associated with lower likelihood of anemia [AORUpper middle = 0.64(0.44–0.92), AORUpper = 0.59 (0.40–0.88)], gastroenteritis [AORUpper = 0.72(0.60–0.86)], typhoid [AORUpper = 0.63(0.41–0.99)], RTI [AORUpper middle = 0.73(0.66–0.81), AORUpper = 0.63(0.56–0.70)] and skin infections [AORUpper middle = 0.73(0.59–0.91), AORUpper = 0.79(0.64–0.98)]. Higher SES also seemed to be associated with higher odds of having HTN [ORUpper middle = 2.35(1.82–3.04), ORUpper = 1.68(1.28–2.21)] and DM [ORUpper middle = 2.44(1.71–3.48), ORUpper = 1.80(1.24–2.61)]. (Tables 3 and 4)

In comparison with respective reference groups, perceived severity of the ailments increased with higher age [for severe disease, AOR41–60 years = 2.34(2.10–2.61), AOR>60 years = 4.25(3.61–5.00)], familial education [for severe disease, AORHigher secondary = 1.41(1.16–1.72), AORGraduation = 1.54(1.26–1.88)], sanitation level regarding toilet use practices [for severe disease, AORGood = 1.38(1.19–1.61)] and SES [for severe disease, AORUpper middle = 1.24(1.08–1.44), AORUpper = 1.33(1.14–1.56)]. Perception of severity was lower among hard-workers [for severe disease, AOR = 0.78(0.67–0.91)] and rural residents [for severe disease, AOR = 0.87(0.77–0.98)]. (Table 3)

With respect to 18–40 year old, younger persons were more likely [AOR5–18 = 2.51(2.22–2.83)], and older residents were less likely [AOR41–60 = 0.59(0.55–0.64), AOR>60 = 0.44(0.39–0.50)] to suffer from communicable diseases (reference = NCD). Compared to respective reference groups, females [AOR = 0.72(0.67–0.77)], residents having higher familial education [AOR = 0.71 (0.62–0.83) and higher SES [AOR = 0.84(0.75–0.92)] had lower likelihood of communicable diseases. Muslims [AOR = 1.18(1.09–1.28)], persons belonging to backward [AOR = 1.15(1.08–1.24)] caste, those who had higher individual education [AORGraduation = 1.38(1.13–1.69) and rural [AOR = 1.47(1.36–1.60)] residents suffered more from communicable diseases. (Table 4)

With reference to respective comparison groups, subjects aged 5–18 years [AORPrivate = 0.69(0.60–0.78), AOR Govt = 0.80(0.68–0.95)], females [AOR Govt = 0.80(0.73–0.88)], Muslim religion [AORPrivate = 0.85(0.69–0.76), ORGovt = 0.92(0.87–0.96)], backward caste [AOR Govt = 0.93(0.91–0.96)], physically demanding occupation [for hard work, AORprivate = 0.72(0.64–0.81), AORGovt = 0.69(0.59–0.81)] and rural residence [AORPrivate = 0.82(0.75–0.89), AORGovt = 0.72(0.64–0.81)] were associated with lower likelihood of visiting qualified practitioners (reference = Non-qualified). Age > 40 years [for 41–60 years age group: AORPrivate = 1.31 (1.21–1.41), AORGovt = 1.29(1.16–1.44); for age > 60 years: AORPrivate = 1.56(1.38–1.78), AORGovt = 1.43(1.20–1.69)], higher individual [for higher secondary: AORPrivate = 1.42(1.19–1.69) and for Graduation: AORPrivate = 1.30(1.06–1.59)] and familial education [for higher secondary: AORPrivate = 1.26(1.13–1.41) and for Graduation: AORPrivate = 1.40(1.22–1.62)], better sanitary practices [for average practice: AORPrivate = 1.17(1.07–1.28) and for good practice: AORPrivate = 1.58(1.42–1.75)] and higher SES [for Upper middle: AORPrivate = 1.59(1.43–1.77) and for Upper: AORPrivate = 1.51(1.35–1.69)] were associated with higher odds of seeking care from qualified (reference = Non-qualified) practitioners. (Table 4)

Likelihood of visiting qualified practitioners were lower among subjects who suffered from APD [AORPrivate = 0.41(0.37–0.46), AORGovt = 0.36(0.31–0.43)], OA [AORPrivate = 0.72(0.59–0.88), AORGovt = 0.58(0.43–0.78)], gastroenteritis [AORPrivate = 0.28(0.24–0.33), AORGovt = 0.69(0.58–0.81)], RTI [AORPrivate = 0.35(0.32–0.39), AORGovt = 0.46(0.41–0.52)], skin infections [AORPrivate = 0.65(0.55–0.77)]. Those who had COPD [AORPrivate = 1.80(1.46–2.23), AORGovt = 1.78(1.38–2.31)], HTN [AORPrivate = 1.94(1.60–2.36), AORGovt = 1.37(1.05–1.79)],...
Table 3: Association (both unadjusted and adjusted) of socio-demographic characteristics with self-perceived specific non-communicable morbidities and their severity among rural residents of Maldah, West Bengal, India (N = 4399).
| Socio-demographics Categories | Measurement (Unadj = Bivariate Adj = Multivariate) | Suffering from specific non-communicable ailments (Based on last three episodes of ill-health) | Perceived severity of disease (Ref = Mild) |
|-------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------|
|                               | Acid peptic disorder                              | COPD                                                                                    | Hypertension                             | Diabetes Mellitus                        | Anemia                                   | Osteoarthritis                          |
|                               | OR (95% CI) p value                               | OR (95% CI) p value                                                                       | OR (95% CI) p value                      | OR (95% CI) p value                       | OR (95% CI) p value                      | OR (95% CI) p value                      |
|                               |                                                   |                                                                                        |                                          |                                          |                                          |                                          |
| Socio-economic status         |                                                  |                                                                                        |                                          |                                          |                                          |                                          |
| Poor                          | 1.21(1.07–1.37) 0.0027                           | 1.03(1.00–1.11) 0.7839                                                                 | 2.12(1.64–2.74) <.0001                   | 1.89(1.28–2.86) 0.0010                   | 0.95(0.72–1.32) 0.7015                   | 1.04(0.90–1.36) 0.7708                   |
| Adj                           | 1.06(0.93–1.22) 0.6868                           | 1.02(0.67–1.51) 0.8647                                                                 | 2.40(1.84–3.14) <.0001                   | 2.43(1.86–3.22) <.0001                   | 1.09(0.86–1.39) 0.2921                   | 1.24(1.02–1.52) 0.0265                   |
| Lower middle                  | 1.14(1.00–1.31) 0.0572                           | 0.88(0.67–1.15) 0.3441                                                                  | 2.04(1.64–2.52) <.0001                   | 2.43(1.86–3.22) <.0001                   | 0.96(0.72–1.30) 0.8016                   | 1.19(1.01–1.42) 0.0079                   |
| Upper middle                  | 1.03(0.90–1.16) 0.7501                           | 0.93(0.72–1.18) 0.3314                                                                  | 2.30(1.82–3.04) <.0001                   | 2.40(1.71–3.48) <.0001                   | 0.97(0.69–1.37) 0.6472                   | 1.24(1.02–1.52) 0.0265                   |
| Upper                         | 0.98(0.85–1.14) 0.8120                           | 1.00(0.75–1.34) 0.9983                                                                  | 1.02(0.75–1.32) 0.8930                   | 0.97(0.65–1.44) 0.6610                   | 0.64(0.44–0.93) 0.0152                   | 1.09(0.82–1.46) 0.5353                   |
|                               | 0.97(0.85–1.11) 0.6451                           | 0.78(0.60–1.01) 0.0534                                                                  | 1.68(1.28–2.21) 0.0022                   | 1.80(1.24–2.51) 0.0021                   | 0.70(0.40–1.27) 0.4709                   | 1.24(1.02–1.52) 0.0109                   |
|                               | 1.07(0.82–1.36) 0.3873                           | 0.91(0.67–1.25) 0.5742                                                                  | 1.19(0.86–1.65) 0.2021                   | 0.97(0.64–1.48) 0.8633                   | 0.59(0.40–0.90) 0.0204                   | 1.11(0.82–1.51) 0.4686                   |

COPD = Chronic obstructive pulmonary disease; OR = Odds ratio; 95% CI = 95% confidence interval; *' Refer to situation where valid estimate for the Odds Ratio could not be determined owing to insufficient cell values.

doi:10.1371/journal.pone.0125865.t003
| Education level of the household head | Primary | Secondary | Higher | Graduation and above | Graduation and above | Graduation and above | Graduation and above | Graduation and above |
|--------------------------------------|---------|-----------|--------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Maximum educational level among staff household members (if available) | Primary | Secondary | Higher | Graduation and above | Graduation and above | Graduation and above | Graduation and above | Graduation and above |
| Marital status | Single | Married | Widow | Divorced | Single | Married | Widow | Divorced |
| Age of the head of the household (years) | < 40 years | 40-60 years | > 60 years | < 40 years | 40-60 years | > 60 years | < 40 years | 40-60 years | > 60 years | < 40 years | 40-60 years | > 60 years | < 40 years | 40-60 years | > 60 years |
| Gender | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female |
| Religion | Hindu | Muslim | Hindu | Muslim | Hindu | Muslim | Hindu | Muslim | Hindu | Muslim | Hindu | Muslim | Hindu | Muslim | Hindu | Muslim |
| Occupation | Industrial | Agricultural | Industrial | Agricultural | Industrial | Agricultural | Industrial | Agricultural | Industrial | Agricultural | Industrial | Agricultural | Industrial | Agricultural | Industrial | Agricultural |
| Perceived Morbidity and Healthcare-Seeking Pattern in Maldah, India

Table 4. Association (both unadjusted and adjusted) of socio-demographic characteristics with self-perceived specific communicable morbidities, type of ailments and respective care-seeking pattern among recruited residents of Malda, West Bengal, India (N = 4399).
Table 4. (Continued)

| Socio-demographics Categories | Measurement (Unadj = Bivariate Adj = Multivariate) | Suffering from specific communicable ailments (Based on last 3 episodes of ill-health) | Type of Self-perceived morbidity (most recent) | Care sought from (Ref = Non-qualified) |
|------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                              |                                  | Gastroenteritis | Typhoid | Respiratory tract infection | Skin infections and related disorders | Communicable diseases | Qualified, private sector practitioner | Qualified, Govt. sector practitioner |
|                              |                                  | OR (95%CI) p value | OR (95%CI) p value | OR (95%CI) p value | OR (95%CI) p value | OR (95%CI) p value | OR (95%CI) p value | OR (95%CI) p value |
| Sanitation level regarding toilet use (Ref = Poor) | Average Unadj | 0.78(0.70-0.86) <0.0001 | 0.93(0.70-1.22) 0.5657 | 0.91(0.86-0.97) 0.0053 | 0.76(0.66-0.87) 0.0001 | 0.79(0.74-0.84) <0.0001 | 1.67(1.35-1.79) <0.0001 | 1.17(1.06-1.28) 0.0011 |
|                              | Adj | 1.17(1.02-1.34) 0.0253 | 1.12(0.81-1.54) 0.4905 | 1.07(0.99-1.16) 0.1089 | 0.91(0.77-1.07) 0.2523 | 1.01(0.93-1.09) 0.8903 | 1.17(1.07-1.28) 0.0004 | 1.06(0.95-1.18) 0.3021 |
|                              | Good Unadj | 0.51(0.45-0.57) <0.0001 | 0.46(0.31-0.66) <0.0001 | 0.75(0.70-0.81) <0.0001 | 0.57(0.46-0.67) <0.0001 | 0.47(0.44-0.51) <0.0001 | 3.12(2.30-3.37) <0.0001 | 1.22(1.19-1.36) 0.002 |
|                              | Adj | 0.99(0.82-1.19) 0.8963 | 0.81(0.50-1.32) 0.3864 | 0.97(0.78-1.28) 0.5920 | 0.87(0.69-1.09) 0.2259 | 0.76(0.70-0.82) <0.0001 | 1.36(1.42-1.75) <0.0001 | 0.94(0.81-1.08) 0.3918 |
| Socio-economic status (Ref = Very poor) | Poor Unadj | 0.76(0.64-0.86) <0.0001 | 0.92(0.62-1.33) 0.3919 | 0.91(0.80-0.93) 0.0001 | 0.71(0.59-0.85) <0.0001 | 0.77(0.71-0.83) <0.0001 | 1.76(1.41-2.19) <0.0001 | 1.18(1.05-1.32) 0.0025 |
|                              | Adj | 0.94(0.79-1.13) 0.4221 | 1.01(0.67-1.55) 0.9472 | 0.87(0.68-1.16) 0.5003 | 0.82(0.66-1.00) 0.0548 | 0.98(0.90-1.07) 0.6021 | 1.23(1.11-1.36) <0.0001 | 1.14(1.01-1.29) 0.0421 |
|                              | Lower middle Unadj | 0.86(0.56-0.76) <0.0001 | 0.98(0.66-1.47) 0.9040 | 0.75(0.69-0.82) <0.0001 | 0.67(0.54-0.82) <0.0001 | 0.73(0.67-0.79) <0.0001 | 2.09(1.80-2.38) <0001 | 1.15(1.08-1.25) 0.1190 |
|                              | Adj | 0.79(0.65-0.95) 0.0142 | 1.17(0.76-1.81) 0.4706 | 0.85(0.77-0.94) 0.0024 | 0.78(0.62-0.98) 0.0286 | 0.95(0.86-1.05) 0.3006 | 1.41(1.25-1.57) <0.0001 | 1.11(1.07-1.38) 0.1436 |
|                              | Upper middle Unadj | 0.73(0.64-0.84) <0.0001 | 1.00(0.69-1.46) 0.9973 | 0.67(0.62-0.73) <0.0001 | 0.68(0.56-0.81) <0.0001 | 0.78(0.72-0.85) <0.0001 | 2.38(2.09-2.69) <0001 | 0.99(0.87-1.11) 0.8234 |
|                              | Adj | 0.85(0.72-1.01) 0.0657 | 0.96(0.64-1.46) 0.8612 | 0.73(0.66-0.81) <0.0001 | 0.73(0.59-0.91) 0.0044 | 0.95(0.86-1.05) 0.3002 | 1.59(1.43-1.77) <0001 | 1.06(1.02-1.21) 0.4328 |
|                              | Upper Unadj | 0.71(0.62-0.81) <0.0001 | 0.92(0.63-1.36) 0.8827 | 0.63(0.58-0.68) <0.0001 | 0.78(0.66-0.94) <0.0001 | 0.96(0.79-1.13) 0.0001 | 1.85(1.49-2.29) <0001 | 0.90(0.88-1.12) 0.9137 |
|                              | Adj | 0.72(0.62-0.86) 0.0004 | 0.83(0.61-0.99) 0.0445 | 0.83(0.55-0.70) <0.0001 | 0.78(0.67-0.90) 0.0034 | 0.84(0.75-0.92) 0.0005 | 1.51(1.35-1.68) <0001 | 1.08(1.03-1.15) 0.3061 |

OR = Odds ratio; 95% CI = 95% confidence interval; *p* Refer to situation where valid estimate for the Odds Ratio could not be determined owing to insufficient cell values.

doi:10.1371/journal.pone.0125865.t004
Surprisingly, among recruited residents of Malda, West Bengal, India (N = 43999).

Table 5. Association (both unadjusted and adjusted) of self-perceived specific morbidity type, specific ailments and severity with respective care-seeking pattern among recruited residents of Malda, West Bengal, India (N = 43999).

| Type of Self-perceived morbidity (most recent) | Measurement (Unadj = Bivariate Adj = Multivariate) | Care sought from (Ref = Non-qualified) |
|----------------------------------------------|-------------------------------------------------|--------------------------------------|
| Non-communicable diseases (Ref = communicable) | Unadj 2.31(2.18–2.45) <.0001 Adj 2.31(2.16–2.48) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Acid peptic disorder | Unadj 0.47(0.43–0.52) <.0001 Adj 0.41(0.37–0.46) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Chronic obstructive pulmonary disease | Unadj 1.96(1.62–2.37) <.0001 Adj 1.80(1.46–2.23) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Hypertension | Unadj 2.53(1.72–3.87) <.0001 Adj 2.34(2.06–2.62) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Diabetes Mellitus | Unadj 7.73(5.62–10.64) <.0001 Adj 4.94(3.55–6.87) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Anaemia | Unadj 0.75(0.59–0.94) 0.0123 Adj 0.84(0.66–1.08) 0.1714 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Osteoarthritis | Unadj 0.84(0.70–1.01) 0.0641 Adj 0.72(0.59–0.88) 0.0014 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Gastroenteritis | Unadj 0.33(0.29–0.37) <.0001 Adj 0.28(0.24–0.33) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Typhoid | Unadj 2.53(1.85–3.45) <.0001 Adj 2.86(2.04–4.03) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Respiratory tract infection | Unadj 0.43(0.40–0.46) <.0001 Adj 0.35(0.32–0.39) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Skin infections and related disorders | Unadj 0.63(0.54–0.72) <.0001 Adj 0.65(0.55–0.77) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Self-perceived severity (Ref = Mild) | Moderate Unadj 1.28(1.15–1.44) <.0001 Adj 1.32(1.16–1.51) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |
| Severe | Unadj 3.32(3.06–3.61) <.0001 Adj 3.16(2.86–3.49) <.0001 | Quali. private sector pract. OR (95%CI) p value Quali. Govt. sector pract. OR (95%CI) p value |

OR = Odds ratio; 95% CI = 95% confidence interval

doi:10.1371/journal.pone.0125865.005

DM [AORPrivate = 4.94(3.55–6.87), AORGovt = 3.28(2.20–4.91)], typhoid [AORPrivate = 2.86 (2.04–4.03), AORGovt = 3.95(2.70–5.79)] and NCDs [AORPrivate = 2.31(2.16–2.48), AORGovt = 1.30(1.18–1.42)] were more likely to visit qualified practitioners. Higher self-perceived disease severity (for moderate: AORPrivate = 1.32(1.16–1.51); for severe: AORPrivate = 3.16(2.86–3.49), AORGovt = 1.95(1.71–2.24)] was also positively associated with visiting qualified practitioners.

(Table 5)

Discussion

The socio-demographic distribution of the recruited population in Malda district was typically identical with a developing world poor-resource setting with potential loopholes in healthcare delivery system. The proportion of underprivileged class, poor education, rural residence, sedentary work, poor access to safe water, poor sanitation and overall lower SES rendered the residents of this district vulnerable to morbidity and poor healthcare-seeking.
More than half (55.91%) of the participants suffered from some recent morbidity while respiratory, gastrointestinal and musculoskeletal diseases were most common. This observed burden of self-perceived morbidity was considerably higher than previously reported values (ranged between 27% and 48%) in similar settings.[26–29] Studies conducted in other parts of the globe,[26–28] also indicated that respiratory, gastrointestinal and musculoskeletal ailments were perceived commonly.[26,28,30,31] Probably the chronic and disturbing symptoms of these slowly progressive ailments resulted in more attention. Cardio-vascular diseases were generally reported less as we observed.[26] Burden of reported NCDs was marginally higher than communicable diseases.

More than half of the ailments were treated by non-qualified practitioners, which raised a few concerns. Only about 13% visited qualified physicians from Govt. sector. The scenario seemed similar to that of other parts of India, Vietnam and Bangladesh [26,28,32] but a bit different from Afghanistan and Nepal where majority visited Govt. doctors.[33,34] Easy availability, less fees and better responsiveness were probably in favor of visiting non-qualified practitioners. Unlike other settings, among subjects visiting non-qualified practitioners, proportion of communicable diseases were higher compared to NCDs while qualified practitioners from private sector treated more NCDs compared to their counterparts from Govt. sector.[35–37] The results probably indicated towards the lack of provision to quality healthcare services from Governmental sector in these areas, leading to increased inequality in healthcare-seeking. The resultant high burden of out-of-pocket healthcare costs disproportionately affected the poorer population compelling them towards healthcare-seeking from non-qualified practitioners. NCDs probably were given more importance due to their persistent symptoms and the community was probably less confident about the ability of non-qualified practitioners regarding treatment of these diseases.

Among specific ailments, RTI was perceived to be the commonest, followed by APD, gastroenteritis and skin problem. Contrary to some other study, perceived burden of HTN and DM were found to be relatively lower.[29] May be some of the asymptomatic, mild or currently controlled (on medication) cases were missed.

While more than two third subjects considered their ailments as less severe, those who perceived the severity, visited qualified doctors especially in private sector. The perceived severity probably helped them to overcome the potential barriers (may include: cost, transport, availability and waiting time related issues) in better healthcare-seeking.[28,31,34,35,38,39]

Corroborating with prior observation in similar settings elsewhere, children and adolescents were less likely to suffer from NCDs like APD, COPD, HTN, DM, anemia and OA but more from RTI, gastroenteritis and skin infection.[27,33,35,36,40] As evidenced in previous studies, elderly subjects were more prone to APD, COPD, HTN, DM, OA, gastroenteritis and RTI while among adults, risk of these diseases increased with age.[26–29,41,42]

Similar to some previous observation, females had higher likelihood of having APD, anemia and OA but less likely to suffer from COPD and DM [26–28] but gender was not found to be associated with communicable diseases.[33,34,36] Muslims suffered less from APD and gastroenteritis but more from DM, typhoid and skin infections. Subjects belonging to SC/ST/OBC castes suffered less from APD, HTN and anemia but more from typhoid. Probably lower awareness and resultant less attention for milder symptoms did influence the patterns of perceived morbidity.

Supporting some prior evidences [27] and contradicting a few,[26,29] our study indicated that higher household education was probably an important predictor for lowering the risk of APD, COPD, anemia, OA, gastroenteritis and RTI while having more education did not individually help the subjects to suffer less except for COPD. Instead regarding HTN, DM and RTI, corroborating available information, higher individual education was associated with
increased morbidity. Compared to individual, household education was probably a stronger predictor for healthy practice and proper decision-making regarding care-seeking, together resulting in less morbidity. On the other hand, for subjects with higher education, sedentary work, occupational pressure and better awareness probably increased the perceived burden of HTN, DM, RTI etc.

Occupation with hard work was associated with higher odds of APD and anemia but lower odds of COPD and HTN. Physical exertion, work environment and appropriate nutrition probably were the key factors. Negative association between physical activity and HTN was well-established in prior studies.

Rural residents compared to urban were less prone to HTN (may be due to environmental factors, less anxiety and stress) but they had higher likelihood of having OA, gastroenteritis, typhoid, RTI and skin infection most likely due to lifestyle related factors, less awareness, poor hygiene and inappropriate sanitation. Urban preponderance of HTN was also reported previously although some researchers did not find significant rural/urban variation.

Drinking safer water was associated with higher perceived burden of HTN and DM. Subjects having better sanitary practices regarding toilet use were also suffering more from APD, HTN, DM and OA. Health awareness and knowledge as probably a confounder here that positively influenced both better practices (regarding drinking safe water, toilet use etc.) and improved perception. Reverse causation might also be a possibility (being diagnosed with the disease resulted in better sanitation and hygiene). Drinking safer water and practicing better sanitation regarding toilet use seemed to be also associated with lower likelihood of suffering from gastroenteritis, typhoid, RTI and skin infections.

Alike prior studies, we also found that, residents having comparatively higher SES were less likely to suffer from anemia, gastroenteritis, typhoid, RTI and skin infections but seemed to be having higher odds of having HTN and DM. While better SES could have improved awareness and in turn better identification of NCDs, means to prevent communicable diseases were also probably better available to them.

Perceived severity of ailments was higher among those with higher age, better familial education, improved sanitation and upper SES and lower among hard-workers and rural residents had. Higher severity of self-perceived morbidity among elderly was also reported previously. Thus perception of severity also seemed to be driven by awareness and knowledge regarding the ailments.

Compared to those aged between 18–40 years, 5–18 years age group were more likely, and older residents were less likely to suffer from communicable diseases than NCDs. Female gender, better familial education and higher SES were negatively associated with risk of communicable diseases. Muslim religion, backward caste, higher individual education and rural residents had higher odds of suffering from communicable diseases.

Socio-demographic predictors of Healthcare-seeking behavior in our study were quite similar to those reported from other parts of the world as well as India with some variations. While elderly subjects commonly visited qualified private and govt. sector physicians, older children, adolescents and females were less likely to be treated by qualified physicians. Although in our study compared to Hindus, Muslims visited qualified practitioners less often, in Nepal, religion was not associated with healthcare-seeking. Backward castes, subjects with physically demanding jobs and rural residents also had lower odds of being treated by qualified practitioners. Subjects having higher individual and familial education, access to better quality of drinking water, better sanitary practices and higher SES were more likely to visit qualified private practitioners. Thus as a whole it was evident that while healthcare-seeking subjects having weaker socio-demographic and economic position had higher likelihood of visiting non-qualified practitioners while
extremes of ages were more often treated by qualified ones. Likelihood of visiting qualified doctors in private sector was positively associated with higher socio-economic position and health consciousness.

Subjects suffering from NCDs were more likely to visit qualified practitioners especially the private sector. Subjects suffering from COPD, HTN, DM and typhoid had higher likelihood of visiting qualified practitioners. Probably recurrent, short-lasting ailments were not influential enough to pursue the residents to overcome the barriers of better healthcare-seeking while chronic diseases of incurable nature were.

Self-perceived severity of ailments were positively associated with odds of visiting qualified practitioners more so in private sector and this finding also supported prior evidences. The perception that more severe diseases were worth paying more attention, time and money and thus visiting qualified doctors especially in the private sector probably was reflected here.

Despite efficient sampling design, use of detailed questionnaire and robust analyses, our study had certain limitations. Like any other cross-sectional study, causal interpretation of the observed associations is not recommended. Due to the potential vulnerability to temporal ambiguity by design, some of our observations might have suffered from reverse causation. Although self-perceived morbidity and severity are currently being considered an efficient parameter for the estimation of health needs in communities worldwide, keeping the lower literacy and potential lack of awareness in mind, the reported self-perceived morbidity pattern should only be interpreted as perceived health need of the community, not the prevalence. Residual confounding due to variables not included in our analyses could also be an issue. Information bias due to misclassification of self-reported information should always be kept in mind, especially due to the potential for differential recall. But we do not consider those to be serious issues here because we only dealt with the recent ailments, hence recall period was short and in majority of cases, medical records were consulted. Although results of our study should be extrapolated beyond the study sample with caution, still we are not worried about the generalizability of our results due to the representative nature of our study sample and very low (<8%) non-response.

Conclusion

In this poor-resource setting, most important predictor for healthcare-seeking was the perception regarding severity and nature of ailments, while age, gender, caste, religion, familial education, SES, residential area, sanitation and hygiene influenced the morbidity pattern and relevant healthcare-seeking. Keeping the high burden of self-perceived morbidity in mind, interventions to improve physical health, awareness and care-seeking practices targeting children, elderly, females, backward castes, minority groups, illiterates, rural residents and those having lower SES, poor sanitary practices and inadequate access to safe drinking water were required urgently. Simultaneously, efforts to improve the healthcare service delivery might consider implementation of intervention targeting improvement of knowledge and practice among non-qualified practitioners in poor-resource settings where seeking healthcare services from these practitioners seemed to be a common occurrence.

Acknowledgments

Authors express their deep gratitude to Professor V. I. Mathan (Former Chair, National Institute of Epidemiology, Chennai and Chairman of the Scientific Advisory Committee, NICED,
Kolkata) and Dr. Sekhar Chakrabarti (Scientist G and Director in Charge, National Institute of Cholera and Enteric Diseases, Kolkata) for critically reviewing the proposal and the result. The authors also acknowledge the support of Dr. V. M Katoch (Director General, Indian Council of medical Research, Government of India) and Dr. Rashmi Arora, (Scientist G, Indian Council of Medical Research), for providing necessary logistic and administrative support. The Office of the Chief Medical Officer of Malda provided necessary permission and logistic support for the study. The authors are indebted to Prof (Dr.) Rama Prasad Ray, Dept of Community Medicine, Malda Medical College and Hospital for providing critical inputs and operational help in conducting the study. In addition authors also acknowledge the cooperation of the participants and the project staff.

Author Contributions
Conceived and designed the experiments: SK UKB KS. Performed the experiments: SK KB KS. Analyzed the data: TM SM. Contributed reagents/materials/analysis tools: SK TM SM KS. Wrote the paper: SK TM SM UKB KS.

References
1. Noncommunicable diseases. Media centre, World Health Organization (WHO). 2013. Available: http://www.who.int/mediacentre/factsheets/fs355/en/.
2. Lopez AD, Mathers CD. Measuring the global burden of disease and epidemiological transitions: 2002–2030. Ann Trop Med Parasitol. 2006; 100: 481–499. PMID: 16899150
3. Health transition, Trade, foreign policy, diplomacy and health. World Health Organization (WHO). 2014. Available: http://www.who.int/trade/glossary/story050/en/.
4. Global status report on noncommunicable diseases. World Health organization (WHO). 2011. Available: http://www.who.int/nmh/publications/ncd_report_full_en.pdf.
5. Daar AS, Singer PA, Persad DL, Pramming SK, Matthews DR, Beaglehole R, et al. Grand challenges in chronic non-communicable diseases. Nature. 2007; 450: 494–496. PMID: 18033288
6. Preventing Chronic Diseases: A Vital Investment. World Health Organization (WHO). 2005. Available: http://www.who.int/chp/chronic_disease_report/en/.
7. Boutayeb A. The double burden of communicable and non-communicable diseases in developing countries. Trans R Soc Trop Med Hyg. 2006; 100: 191–199. PMID: 16274715
8. Reddy SK, Shah B, Varghese C, Ramadoss A. Responding to the threat of chronic diseases in India. The Lancet. 2005; 366: 1744–1749. PMID: 16291069
9. John TJ, Dandona L, Sharma VP, Kakkar M. Continuing challenge of infectious diseases in India. The Lancet. 2011; 377: 252–269. doi: 10.1016/S0140-6736(10)61265-2 PMID: 21227500
10. Noncommunicable disease country profiles. Noncommunicable diseases, India. World Health Organization (WHO). 2014. Available: http://www.who.int/nmh/countries/ind_en.pdf.
11. Sharma K. Burden of non communicable diseases in India: Setting priority for action. Int J Med Sci Public Health. 2013; 2:7–11.
12. Quigley MA. Commentary: shifting burden of disease—epidemiological transition in India. Int J Epidemiol. 2006; 35: 1530–1531. PMID: 17092948
13. Hausfeld RG. The social prediction of self-perceived morbidity. Med J Aust. 1973; 2: 975–978. PMID: 4772118
14. Barnett S, Roderick P, Martin D, Diamond I. A multilevel analysis of the effects of rurality and social deprivation on premature limiting long term illness. J Epidemiol Community Health. 2001; 55: 44–51. PMID: 11112950
15. Wagner EH, Stroetz DS. Hypertension labeling and well-being: alternative explanations in cross-sectional data. J Chronic Dis. 1984; 37: 943–947. PMID: 6335515
16. González-Lopez JR, Rodríguez-Gazquez ML, Lomas-Campos ML. Use of health services by adult Latin American immigrants residing in Seville. Invest Educ Enferm. 2014; 32: 347–355. doi: 10.1590/S1230-337X2014000200017 PMID: 25230044
17. The determinants of health. Health Impact Assessment, Use of evidence. World Health Organization (WHO). 2014. Available: http://www.who.int/hia/evidence/doh/en/.
18. Ansah EK, Powell-Jackson T. Can we trust measures of healthcare utilization from household surveys? BMC public health. 2013; 13: 853. doi: 10.1186/1471-2458-13-853 PMID: 24040864

19. Binnendijk E, Koren R, Dror DM. Hardship financing of healthcare among rural poor in Orissa, India. BMC Health Serv Res. 2012; 12: 23. doi: 10.1186/1472-6963-12-23 PMID: 22284934

20. Ahmed SM, Hossain MA. Knowledge and practice of unqualified and semi-qualified allopathic providers in rural Bangladesh: implications for the HRH problem. Health policy. 2007; 84: 332–343. PMID: 17618702

21. Basu S, Chatterjee M, Chandra PK, Basu S. Antibiotic misuse in children by the primary care physicians—an Indian experience. Niger J Clin Pract. 2008; 11: 52–57. PMID: 18689140

22. Bojalil R, Calva JJ. Antibiotic misuse in diarrhea. A household survey in a Mexican community. J Clin Epidemiol. 1994; 47: 147–156. PMID: 8113823

23. Bapna JS, Tekur U, Gitanjali B, Shashindran CH, Thulasimani M, et al. Drug utilization at primary health care level in southern India. Eur J Clin Pharmacol. 1992; 43: 413–415. PMID: 1451722

24. Health on the march 2010–2011, State Bureau of Health Intelligence, Govt. of West Bengal. 2011.

25. Kwak C, Clayton-Matthews A. Multinomial logistic regression. Nurs Res. 2002; 51: 404–410. PMID: 12464761

26. Giang KB, Allebeck P. Self-reported illness and use of health services in a rural district of Vietnam: findings from an epidemiological field laboratory. Scand J Public Health Suppl. 2003; 62: 52–58. PMID: 14649642

27. Rahman MM, Gilmour S, Saito E, Sultana P, Shibuya K. Self-reported illness and household strategies for coping with health-care payments in Bangladesh. Bull World Health Organ. 2013; 91: 449–458. doi: 10.2471/BLT.12.115428 PMID: 24052682

28. Ahmed SM, Tomson G, Petzold M, Kabir ZN. Socioeconomic status overrides age and gender in determining health-seeking behaviour in rural Bangladesh. Bull World Health Organ. 2005; 83: 109–117. PMID: 15744403

29. Ir P, Men C, Lucas H, Meessen B, Decoster K, Bloom G, et al. Self-reported serious illnesses in rural Cambodia: a cross-sectional survey. PLoS One. 2010; 5: e10930. doi: 10.1371/journal.pone.0010930 PMID: 20532180

30. Picavet HS, Hazes JM. Prevalence of self reported musculoskeletal diseases is high. Ann Rheum Dis. 2003; 62: 644–650. PMID: 12810427

31. Ahmed SM, Adams AM, Chowdhury M, Bhuiya A. Gender, socioeconomic development and health-seeking behaviour in Bangladesh. Soc Sci Med. 2000; 51: 361–371. PMID: 10855923

32. Chaturvedi HK, Mahanta J, Pandey A. Treatment-seeking for febrile illness in north-east India: an epidemiological study in the malaria endemic zone. Malar J. 2009; 8: 301. doi: 10.1186/1475-2875-8-301 PMID: 20017909

33. Pokhrel S, Sauerborn R. Household decision-making on child health care in developing countries: the case of Nepal. Health Policy Plan. 2004; 19: 218–233. PMID: 15208278

34. Steinhardt LC, Waters H, Rao KD, Naem AJ, Hansen P, Peters DH. The effect of wealth status on care seeking and health expenditures in Afghanistan. Health Policy Plan. 2009; 24: 1–17. doi: 10.1093/heapoj/czn043 PMID: 19060032

35. Pillai RK, Williams SV, Glick HA, Polsky D, Berlin JA, Lowe RA. Factors affecting decisions to seek treatment for sick children in Kerala, India. Soc Sci Med. 2003; 57: 783–790. PMID: 12850106

36. Sreeramareddy CT, Shankar RP, Sreekumaran BV, Subba SH, Joshi HS, Ramachandran U. Care seeking behaviour for childhood illness-a questionnaire survey in western Nepal. BMC Int Health Hum Rights. 2006; 6: 7. PMID: 16719911

37. Joshi A, Mohan K, Grin G, Perin DM. Burden of healthcare utilization and out-of-pocket costs among individuals with NCDs in an Indian setting. J Community Health. 2013; 38: 320–327. doi: 10.1007/s10900-012-9617-1 PMID: 23054417

38. Pandey A, Sengupta PG, Mondal SK, Gupta DN, Manna B, Ghosh S, et al. Gender differences in healthcare-seeking during common illnesses in a rural community of West Bengal, India. J Health Popul Nutr. 2002; 20: 306–311. PMID: 12659410

39. Willis JR, Kumar V, Mohanty S, Singh P, Singh V, Baqui AH, et al. Gender differences in perception and care-seeking for illness of newborns in rural Uttar Pradesh, India. J Health Popul Nutr. 2009; 27: 62. PMID: 19248649

40. Taffa N, Chepnegeno G. Determinants of health care seeking for childhood illnesses in Nairobi slums. Trop Med Int Health. 2005; 10: 240–245. PMID: 15730508
41. Basu S, Millett C. Social Epidemiology of Hypertension in Middle-Income Countries Determinants of Prevalence, Diagnosis, Treatment, and Control in the WHO SAGE Study. Hypertension. 2013; 62: 18–26. doi:10.1161/HYPERTENSIONAHA.113.01374 PMID: 23670299

42. Ramirez AL, Perez M, Muñoz OJ, Garcia P, Treviño L, Lara P. Family-based health needs along the Texas—Mexico border. J Public Health. 2011; 33: 579–86. doi:10.1093/pubmed/fdr014 PMID: 21339200

43. Gupta R, Pandey R, Misra A, Agrawal A, Misra P, Dey S, et al. High prevalence and low awareness, treatment and control of hypertension in Asian Indian women. J Hum Hypertens. 2011; 26: 585–593. doi: 10.1038/jhh.2011.79 PMID: 21881598

44. Kanungo S, Mahapatra T, Bhaduri B, Mahapatra S, Chakraborty ND, Manna B, et al. Diarrhoea-related knowledge and practice of physicians in urban slums of Kolkata, India. Epidemiol Infect. 2014; 142: 314–326. doi: 10.1017/S0950268813001076 PMID: 23659645

45. Manna B, Nasrin D, Kanungo S, Roy S, Ramamurthy T, Kotloff KL, et al. Determinants of health care seeking for diarrheal illness in young children in urban slums of Kolkata, India. Am J Trop Med Hyg. 2013; 89: 56–61. doi: 10.4269/ajtmh.12-0756 PMID: 23629936