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Burden of Healthcare Utilization and Out-of-Pocket Costs Among Individuals with NCDs in an Indian Setting

Ashish Joshi · Krishna Mohan · Gurmit Grin ·
Douglas Marcel Puricelli Perin

Abstract Non communicable diseases (NCDs) are now the major cause of death and disability worldwide. It increasingly affects people from developing as well as developed countries. Over the coming decades the burden from NCDs is projected to rise particularly fast in the developing world. There is a lack of optimal data collection about the burden of risk factors related to NCDs especially in the developing countries. To assess the burden of healthcare utilization and out-of-pocket costs associated with NCDs in an Indian setting. A cross sectional study was performed to enroll a convenient sample of 166 participants aged 18 years and above from a tertiary hospital in Punjab, a Northern state of India. The data was gathered during the period of Feb 2010–April 2010. A mixed methods approach was used to assess the burden of diabetes, hypertension, high cholesterol, and their associated risk factors. Further we evaluated the burden of healthcare utilization and out-of-pocket costs associated with these conditions using self-reported assessments. Results showed the average age of the participants was 50 years, 63 % (n = 104) were females, 32 % (n = 53) had education less than high school and 20 % (n = 33) had no formal education. About 96 % of the study participants were living with a partner. Majority of the study participants were non-smokers and 17 % (n = 27) of them reported to have history of alcohol consumption. The majority of the participants had access to cell phones (94 %; n = 156) and about 40 % (n = 66) had computers at home. About 33 % (n = 55) of the study participants had some form of previous knowledge of computers. Majority of the study participants went to the private hospital (47.5 %) for seeking healthcare. About 32 % (n = 53) also sought healthcare from some kind of healthcare professional including a primary care doctor or a nurse or even a pharmacist in a village setting. Doctor visits related to diabetes were higher as compared to the individuals either with hypertension or high cholesterol. However; the out-of-pocket costs of the visit to the healthcare professional were much higher for hypertension than for diabetes or high cholesterol. A strengthened surveillance system, effective inter-sectoral action, and improved access to basic healthcare are pivotal to prevent NCDs. A multifaceted NCDs surveillance system could help us measure the burden of risk factors, its associated health care utilization and out of pocket costs, and further facilitate interventions that can guide evidence based decision making.

Keywords Non communicable diseases · Risk factors · Out-of-pocket costs · Healthcare utilization · Surveillance

A. Joshi (✉) · D. M. P. Perin
Department of Health Services Research Administration, Center for Global Health and Development, College of Public Health, UNMC, Omaha, NE, USA
e-mail: ashish.joshi@unmc.edu

K. Mohan
Department of Biochemistry, Saveetha University, Chennai, India

K. Mohan
Foundation of Healthcare Technologies Society, New Delhi, India

G. Grin
Center for Public Health Informatics, Bhubaneswar, India

Background

Non communicable diseases (NCDs) are now the major cause of death and disability worldwide and increasingly affect people from developing as well as developed

countries [1]. NCDs, including cardiovascular diseases (CVD), diabetes, obesity, cancer and respiratory diseases, now account for 60 % of all deaths worldwide and 80 % of these deaths occur in low-or middle income countries [1, 2]. They account for 44 % of premature deaths worldwide [1, 2]. The number of deaths from these diseases is double the number of deaths that results from a combination of infectious diseases (including HIV/AIDS, tuberculosis and malaria), maternal and perinatal conditions, and nutritional deficiencies. Over the coming decades the burden from NCDs is projected to rise particularly fast in the developing world. Without concerted action, some 388 million people worldwide will die of one or more chronic NCDs in the next 10 years [2]. With some concerted action, we can avert at least 36 million premature deaths by 2015. Some 17 million of these prevented deaths would be among the people under the age of 70 [2]. Trends in NCDs can be viewed in two ways: through projection from World Health Organization (WHO) Data in the Global Burden of Disease and Risk Factors report and from individual and cross country observational survey data obtained from official country statistics and private researchers [3]. According to a report produced by the World Economic Forum in 2010, NCDs are a severe threat to global economic development, potentially more detrimental than fiscal crises, natural disasters, or pandemic influenza [4]. It is projected that in the next 10 years, China, India, and Britain will lose $558, $237 and $33 billion, respectively in national income as a result of largely preventable heart disease, strokes, and diabetes [5].

It is estimated that India accounts for 17 % of global cardiovascular mortality [6], and this is projected to rise to 50 % in the future. Secular trends in NCDs in India are difficult to determine precisely because of the lack of prospective studies, disease definition over time, and varied study design methodology. Results of previous studies suggest that there has been a gradual increase in the prevalence of NCDs. Further, the rural–urban divide for the prevalence of NCDs has significantly increased over a period of time [7–9]. Overall however, the diversity of the country requires a larger networked approach aimed at evaluating individual and societal risk [10]. There are many initiatives in India examining at NCDs, including the Prospective Urban Rural Epidemiology (PURE) study, the Million Death Study, the Indian Migration Study, and the Integrated Disease Surveillance Program (IDSP) among others [10]. The recent INTERHEART study indicated that nine factors (smoking, raised ApoB/ApoA1 ratio, history of hypertension, diabetes, abdominal obesity, psychosocial factors, daily consumption of fruits and vegetables, regular alcohol consumption, daily physical activity) collectively accounted for 90 % of the population attributable risk in men and 94 % in women with regard to myocardial infarction

(MI), and that similar associations between the risk factors and MI were noted among different populations in the world [11]. The challenge is to translate knowledge into effective interventions. Hence, surveillance of selected NCDs risk factors will be performed by periodic cross-sectional surveys in selected, representative sample conducted once in 3–5 years in the states in India as part of the IDSP [12, 13]. The Indian Migration Study which compares migrant and non-migrant siblings in urban and rural settings is particularly useful to study the impact of migration on the development of risk factors for NCD [14] and will be increasingly important as urbanization in India increases.

Many developing countries now find themselves at a stage of epidemiologic behavioral transition in which they face a growing burden of NCDs on top of the ongoing hazards of under-nutrition and communicable diseases. This reflects a significant change in diet habits, physical activity levels, and tobacco use. A recent report from the WHO identified six risk factors associated with NCDs as the leading global risk factors for death: tobacco use, physical inactivity, overweight or obesity, high blood pressure, high blood glucose levels, and high cholesterol levels [2]. Moreover, they pervade countries of all income levels; even in low-income countries, 6 of the top 10 risk factors are associated with NCDs [2].

(a) *Urbanization* As economies develop populations tend to migrate from rural areas to towns and cities and their health profiles change. The benefits of prosperity and improved health are compromised by the health risks of such affluent diets and poor lifestyle that historically accompany economic growth [15, 16]. The urban population in India has increased more than threefold in the past 40 years, from nearly 80 million to over 250 million at present. The United Nations projected that by 2025, 50 % of India's population would live in urban areas. This urban expansion coupled with increasing affluence, is leading to increased energy intake and changed food consumption patterns.

(b) *Decrease Intake of Fruits and Vegetables* Most Indians remain vegetarians; India's National Nutrition Monitoring Bureau indicates that animal food intake has doubled over the past three decades among the urban middle class, and to a lesser extent in the rural population [17]. According to a WHO sub national survey of nearly 9000 adults in 2003, fruit and vegetable intake in the vast majority of Indians was below five servings/day in almost 80 % and below 3 servings a day in about 50 % of those surveyed [18].

(c) *Decrease in Physical Activity* Physical activity and energy expenditure continue to decline as more and more of India's agricultural society evolves into industrialized communities. A WHO sub-national survey of

over 10,000 urban and rural adults in India showed a high prevalence of physical inactivity, especially among middle-aged and older adults [19].

(d) *Increase in Body Mass Index* Changing diet and lifestyles patterns in India, while reducing under-nutrition, have exacerbated the incidence of obesity. A prior study of some 11,000 urban adults in India revealed that 35–45 % of middle aged urban adults have a body mass index (BMI) that exceeds 25 [20].

(e) *Type II Diabetes* Type II diabetes among middle class adults and children in India is growing rapidly. Diabetes is now six to ten times more prevalent in India's urban populations than in rural populations, with prevalence among urbanites in the 40–60 age group estimated to range from 15 to 30 % [2]. The number of persons with Type II diabetes in India is expected to double from about 40 million currently to nearly 80 million by 2030 [20].

Non communicable diseases (NCDs) and related risk factors impose a significant burden on both the poor, across countries and within countries; and those of working age [21]. Approximately 80 % of all disability adjusted life years (DALYs) are lost due to NCDs before age 60 in low- and middle-income countries. The global burden of disease (GBD) Project 2005 examined the overall burden of disease across countries and aggregated regional data on causes of death according to the income groups categories used by the World Bank: lower-middle, upper middle and high income. It established the fact that economic growth and prevalence of NCDs are related. Prior studies and reports have assessed the economic impacts of NCDs in India and found that they infringe huge welfare losses for both households and the general economy [11], [22–25]. A study conducted in 2000 calculated the costs of diabetes among sample population of Chennai and found that out-of-pocket spending due to diabetes during hospitalization was INR 5,300 per event. Further, another study estimated that the direct and indirect costs of treatment of chronic obstructive pulmonary disease (COPD) in India found that treatment costs for a patient with severe COPD was nearly INR 33,000 in 2001. Apart from these, the annual income losses to households affected by CVDs in India in 2004 were 144–158 billion INR, which occupied more than one-third of all income losses out of all NCDs [11].

Disease surveillance is considered as the backbone of public health programs in India. Information on risk factors is essential predictors of future disease and injury. As per the previous WHO Report, five important risk factors for NCDs identified globally include raised blood pressure, raised cholesterol, tobacco use, alcohol consumption, and overweight. Country level data is sparse for many of these NCDs risk factors. There is a need to gather optimal data

about the risk factors of NCDs and their impact on healthcare utilization and out-of-pocket costs.

The objective of our study is to assess the burden of healthcare utilization and out-of-pocket costs associated with NCDs in an Indian setting.

Methods

A cross sectional study was performed to enroll a convenient sample of 166 participants aged 18 years and above from a tertiary hospital in Punjab, a Northern state of India. The data was gathered from Feb 2010 to April 2010. A mixed methods approach was used to assess the burden of diabetes, hypertension, high cholesterol, and their risk factors, healthcare utilization and out-of-pocket costs. This approach helped to capture a variety of behaviors, attitudes, or beliefs of the community directly in the survey [26]. Both qualitative and quantitative data was gathered in the same questionnaire to provide support and context for understanding the survey's findings.

Quantitative information came in numbers and answered questions like how many, how much, or to what extent. Qualitative information came in written words where the respondent expressed his or her thoughts on a particular topic. The study participants were informed about the purpose of the study and those willing to participate were enrolled into the study. No identifiable information was gathered and informed consents were obtained. The protocol was approved by the Institutional Review Board at University of Maryland Baltimore County.

Variables Gathered

Socio-Demographics

Information gathered included age (years), gender, educational status, marital and living status, employment status and its duration (years), height and weight (kilograms). Information was also gathered about the family history of diabetes, hypertension and high cholesterol among the study participants.

Health Behavior

Information gathered included history of current and past smoking (yes/no), alcohol consumption (yes/no) and history of drug abuse (yes/no). Additional information was gathered on the frequency of smoking and alcohol consumption. BMI of the individuals was derived from the self report data on height and weight of the subjects.

Technology Assessment

Information gathered included the use of cell phones, familiarity and availability of computer and internet at individual homes and work settings, internet related costs. Information was also gathered to determine if internet was used as a medium to search for health information.

Self Monitoring of NCDs

Information was gathered about study participants' self monitoring of their diabetes, hypertension and high blood cholesterol status. Information was also gathered about the duration of these conditions, current treatment (medications) and utilization of medical devices such as blood sugar and blood pressure in their home settings.

Healthcare Utilization

Information about the number of visits to the healthcare professionals, and hospital admissions during the past 12 months due to these medical conditions was also gathered through self-report.

Out-of-Pocket Costs

Information about the out-of-pocket costs due to these medical conditions was gathered. These costs included visits to the healthcare professional, laboratory and diagnostic exams and hospitalizations.

Statistical Analysis

Descriptive analysis was performed using univariate statistics to report means and standard deviations for the continuous variables and the frequency distribution for the categorical variables. Analysis of variance was performed to compare differences in the continuous variables for individuals with diabetes, hypertension and high blood cholesterol. Chi-square analysis was performed to compare the frequency of categorical variables. All analysis was performed using SAS version 9.1.

Results

Results showed the average age of the study participants was 50 years (SD = 14), 63 % (n = 104) of them were females, 32 % (n = 53) had education less than high school and 20 % (n = 33) had no formal education. About 96 % of them lived with a partner. Majority of the study participants were non smokers and 17 % (n = 27) of them reported to have history of alcohol consumption. Table 1 presents a summary of the main demographic characteristics of the study sample.

Table 1 Demographic characteristics of the study sample

Variables	
Socio-demographics	
Age, years, mean (SD)	50 (SD = 14)
Current residence, years	27 (SD = 19)
Male (%)	62 (37 %)
Female (%)	104 (63 %)
Education	
Grade 1–5	16 (10 %)
Grade 6–8	22 (13 %)
Grade 9–11	15 (9 %)
Grade 12	18 (11 %)
College 1–3 years	39 (23 %)
College 4 years or more	19 (11 %)
Post graduate	4 (2 %)
No formal education	33 (20 %)
Living with partner	96 %
Weight (kg)	77 (SD = 11)
Body mass index (BMI)	28 (SD = 4.16)
Health behavior assessment	
Current smoking status	
Yes	1 (1 %)
No	164 (99 %)
Past smoking history	
Never smoked	104 (89 %)
No	7 (6 %)
Yes	6 (5 %)
Body mass index, mean (SD)	
Normal	28 (17 %)
Overweight	92 (56 %)
Obese	45 (27 %)
Alcohol intake	
Never	61 (38 %)
No	74 (46 %)
Yes	27 (17 %)
Drug intake	
No	75 (97 %)
Not willing to tell	1 (1 %)
Yes	1 (1 %)
Missing	127

Results also showed that the majority of the study participants had a family history of hypertension (55 %) and diabetes (26 %) (Fig. 1).

Technology Utilization

Results showed that majority of the participants had access to cell phones (94 %; n = 156) and about 40 % (n = 66) of them had computers at home. About 33 % (n = 55) of

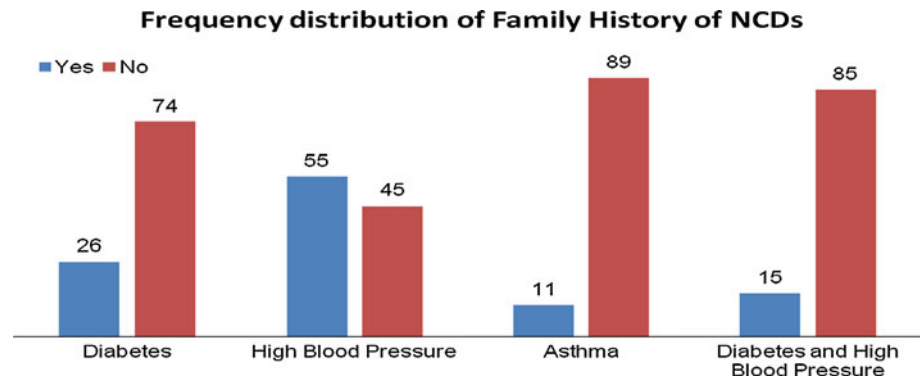**Fig. 1** Frequency distribution of family history burden of NCDs

Fig. 2 Frequency distribution of utilization of technology
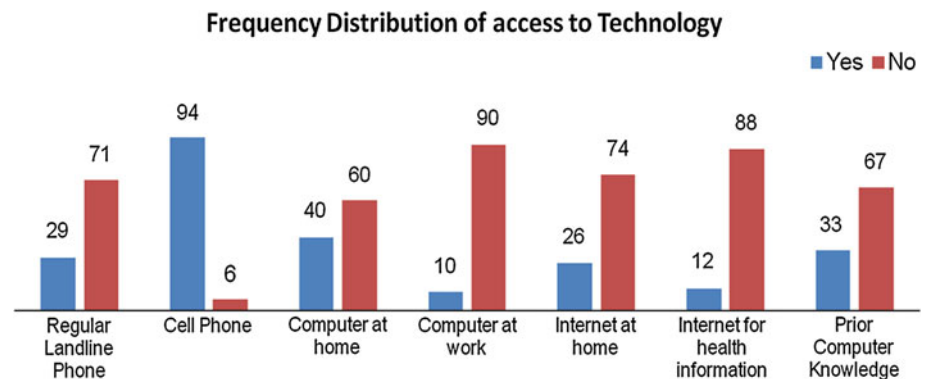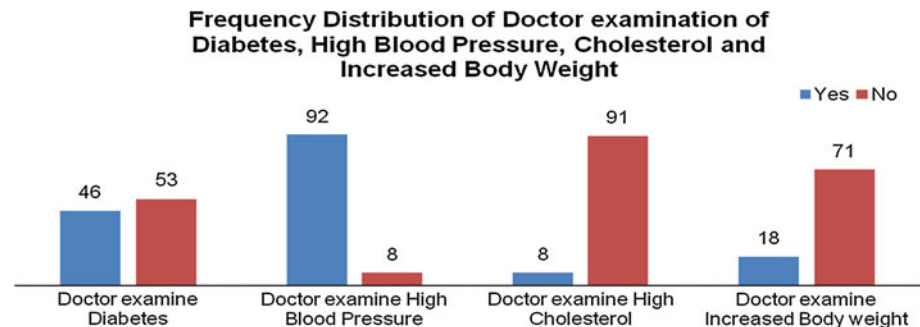

Fig. 3 Frequency distribution of study participants being examined by their doctor at least once for NCDs

the study participants had some form of prior computer knowledge. The average monthly internet cost was INR 540 (SD = 151) (Fig. 2).

Majority of the study participants had been at least once examined by their doctors for high blood pressure (92 %; n = 153) and diabetes (46 %; n = 76) (Fig. 3).

About 30 % (n = 50) of the study participants were reported having diabetes by their doctors. Majority of them were on medications (94 %; n = 156). About 45 % (n = 77) of them were aware about home monitoring of blood sugar but only 8 % of them reported actually doing it. (Fig. 4).

About 80 % (n = 133) of the study participants were reported having high blood pressure by their doctors. Majority of them were taking medicines to manage their blood pressure (95 %; n = 158). More than half of the study participants were aware about home monitoring of blood pressure but only 25 % (n = 42) were actually doing it (Fig. 5).

Only few of the study participants were reported to have high blood cholesterol by their doctors. More than half of them (86 %) were taking cholesterol reducing pills (Fig. 6).

Healthcare Utilization for Diabetes, Hypertension and Cholesterol Participants

The average number of visits to a doctor, nurse or other healthcare professional for the past 12 months for diabetes was 11 (SD = 7), hypertension was 10 (SD = 7) and cholesterol was 6 (SD = 3). Similarly the average number

Fig. 4 Frequency distribution of diabetes related attitudes and practices
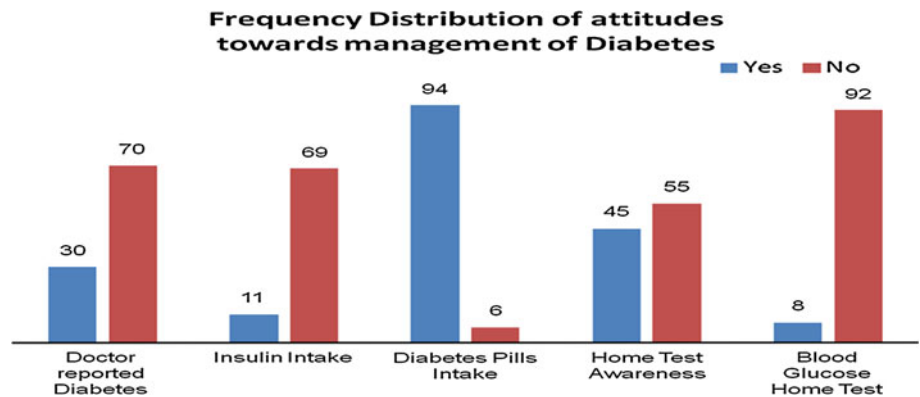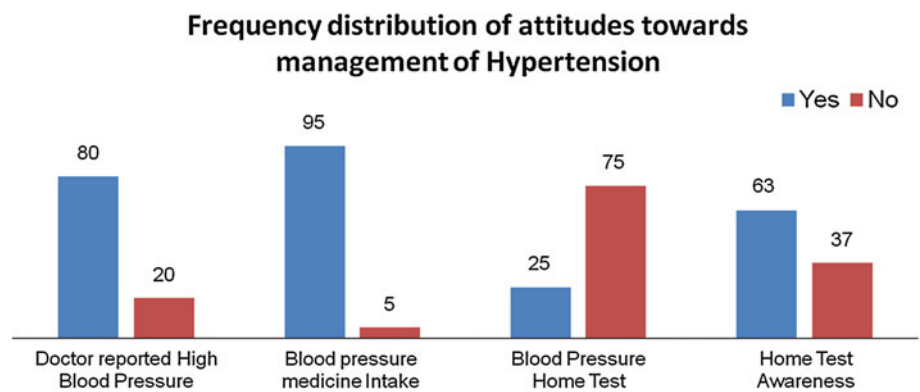
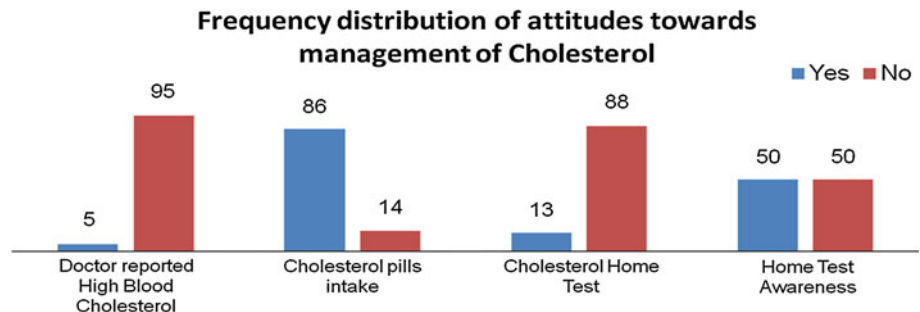Fig. 5 Hypertension attitudes and practices

Fig. 6 Frequency distribution of attitudes towards management of cholesterol

of hospitalizations for the past 12 months for diabetes was 0.44 (SD = 1.80), hypertension was 0.08 (SD = 0.47) and cholesterol was none. The average number of yearly healthcare professional visits and the consultations over the phone for an individual were 13 (SD = 7) and 0.42 (SD = 2.3) respectively. Majority of the individuals had hypertension related doctor visits (77 %; n = 127) as compared to diabetes (28 %; N = 47) or high cholesterol (5 %; n = 8).

Results showed that the average cost of every doctor visit for cholesterol (Mean = 150 INR; SD = 38) was lower than hypertension (Mean = 167 INR; SD = 93) and diabetes (Mean = 166 INR; SD = 94). Majority of the individuals paid 150 INR for diabetes, hypertension and cholesterol related doctor visits. The range of average cost

was 100–800 INR for diabetes, 100–1000 INR for hypertension and 100–200 INR for cholesterol. The average yearly expenditure on doctor related visits due to these medical conditions was 861 INR (SD = 660.7). The range of average yearly expenditure related to these medical conditions for doctor related visits was 200–4000 INR. Majority of the individuals (47 %; n = 77) spent on yearly an average 500–999 INR for the doctor visits related to diabetes, hypertension and cholesterol (Fig. 7).

Information was also gathered to determine where the study participants first went to seek care. Results showed that majority of the study participants went to the private hospital (47.5 %; n = 79) followed by some healthcare professional in their village (32 %; n = 53) for seeking care. The results are similar to one of the previous study

Fig. 7 Frequency distribution of yearly expenditure for doctor related visits for diabetes, hypertension and cholesterol
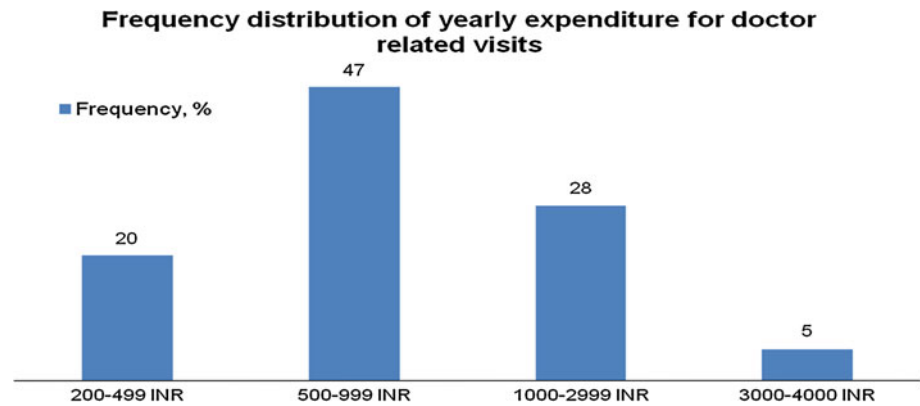
that has shown that the majority of the ailment spells were treated in the private sector [27]. About 11 % (n = 18) of them received care from some form of individual private healthcare professional. Results also showed that majority of the participants used the healthcare professional that was recommended by their friends (45 %; n = 75), followed by the one recommended by the pharmacist (32 %; n = 53) and remaining based on the availability of the healthcare professional who lived close by. 20 % (n = 33).

Discussion

Non communicable diseases (NCDs) account for the greatest share of early death and disability worldwide and this burden is projected to rise particularly fast in the developing world. NCDs are a leading health and developmental challenge and the situation is especially serious in low income- and middle income countries. Our study assesses the self report burden of NCDs (such as diabetes, hypertension and high cholesterol), healthcare utilization, and out-of-pocket costs associated with these medical conditions. Further the study also examined how individuals make decisions to seek care. This paper addresses the following key research questions;

- How do individuals manage their diabetes, hypertension and cholesterol related conditions?
- What is the availability of technology and communication among these individuals?
- Compare healthcare utilization patterns among individuals with diabetes, hypertension and high cholesterol.
- What is the burden of out-of-pocket costs associated with these medical conditions?
- How do individuals make decisions to seek healthcare?

As obesity, hypertension, diabetes are linked to the onset of CVD, early affordable preventive health delivery programs that promote exercise and weight reduction; screening for diabetes and hypertension as another pathway

to both influence exercise and dietary behavior are urgently needed. The treatment of NCDs is expensive and can consume a substantial part of a household's financial resources since the individuals' initially delay seeking care, further require treatment over a long period of time and often require hospitalization.

The economic burden of NCDs is manifold in all levels of society, imposing costs at the individual, family, community and national levels. The growing dominance of NCDs in the share of global disease burden is due to their increase in low/middle income economies, especially India, China and Eastern Europe [28]. In India, health care is predominantly financed through out-of-pocket payments; financing treatment of NCDs can be particularly burdensome, especially for poorer households. One study of diabetes patients in India estimated that medical costs amounted to between 15 and 25 % of household income. The WHO is worried about Indians' high out-of-pocket expenses to buy medicines. WHO says, 3.2 % Indians will fall below the poverty line because of high medical bills. About 70 % of Indians spend their entire income on healthcare and purchasing drugs. About 70 % Indians are spending their out-of-pocket income on medicines and healthcare services in comparison to 30–40 % in other Asian countries. The Planning Commission accepts that out-of-pocket to pay for healthcare costs is a growing problem in India. It says 39 million Indians are pushed to poverty because of ill health every year. Around 30 % in rural India didn't go for any treatment for financial constraints in 2004. In urban areas, 20 % of ailments were untreated for financial problems the same year [28]. About 47 and 31 % of hospital admissions in rural and urban India, respectively, were financed by loans and sale of assets.

A key lesson that has emerged from this effort is the acute paucity of good data and the absence of community-based studies have made it impossible to come up with any credible estimates of the disease burden in India. Better assessment and explanation of the distribution of chronic

disease risk factors by socioeconomic status is useful particularly in developing countries. From a policy perspective, the ability to accurately anticipate the shape of the risk-factor burden will enable more reliable prevention efforts for the groups of society expected to be most at risk.

Limitations of our study are the self-report burden of NCDs and if or not that the costs are apparently associated with NCDs and risk factors. The cross-sectional nature of the data doesn't establish that NCDs or risk factors cause the costs to occur. There is little evidence of causation and it is important to reflect on whether respondents are able to accurately indicate whether their expenditures are really attributable to NCDs.

Challenges to prevention of non-communicable diseases, such as strengthened surveillance, more effective intersectoral action, and improved access to basic health care (including medicines and technologies) are pivotal to better healthcare delivery outcomes. There is a tremendous need of a multifaceted NCDs surveillance system that should include reporting of NCDs, health care utilization (hospitalization, healthcare and allied health professional visits) associated costs (laboratory and diagnostic costs and pharmacy costs) to better document individual knowledge attitudes and practices towards the management NCDs and its clinical and non clinical impact on health outcomes.

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