Economic burden of diabetes patients in Latur, India: A Cross Sectional Study

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Abstract

Diabetes mellitus is a modern-day epidemic, silently negative affecting the household economy. The epidemical diabetic burden has increased with the economic burden worldwide. The present study tries to estimate the direct and indirect economic burden of diabetes among diabetes patients. It utilises the empirical data collected from 505 self-reported diabetic patients during May to November 2017. Bivariate and Multivariate techniques were used for data analysis. The results show that more than one fourth of the household monthly income is incurred on direct health expenditure on diabetics. The study reveals that there is a disproportionate economic burden of diabetes among people belonging to rural areas from poor households, illiterate, currently not working patients and patients belonging to social groups including SCs/STs. From a policy point of view there is an urgent need to strengthen public health infrastructure at various community levels (viz. sub-centres, PHCs, and CHCs) with the facility of blood sugar tests and accessibility of medication by subsidized rate to the diabetic person. There is a need for awareness and coverage of community health insurance schemes.

Keywords: Diabetes, direct expenditure, indirect expenditure, Latur.

I.   Introduction

Diabetes is a common chronic disease that not only causes deterioration in the normal state of human life but also poses a wide range of socioeconomic challenges, especially in developing societies across the globe. It is known that with the rising number of diabetic cases, there is a mounting economic burden at every level, be it at the individual, household, or societal. The distress of accessing medical care is even more serious when it comes to disadvantaged social groups residing in rural areas, which are generally recognized as economically weaker sections of the society. The International Diabetes Federation (IDF, 2014) estimated that 387 million people with diabetes live in the age group of 20-79 years worldwide, and this number is projected to increase to over 592 million by 2035 (Guariguta et al., 2014). The prevalence of diabetes is expected to rise in the developing world due to factors such as an aging population, urbanization, genetic predisposition, lifestyle changes and an increase in obesity and physical inactivity (Chan et al., 2009; Mohan et al., 2007; Wild et al., 2004).

The increasing incidence of diabetes presents a significant challenge in India, impacting healthcare, finances, and society at large. The financial burden associated with diabetes management is substantial and, on the rise, globally. However, there is a dearth of comprehensive data regarding expenditure on diabetes care in developing nations like India, where healthcare infrastructure is fragmented. The uniform documentation of medical information, including treatment costs, is limited due to the absence of a robust healthcare system. Both private and public healthcare sectors operate within the country (Ramchandra et al., 2007).

A budget allocation of only 2 per cent for healthcare by the government is grossly inadequate. In India, there is no uniform healthcare system available to everyone (Ramachandran, 2002). The

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economic burden of diabetes is enormous as it perpetuates and exacerbates poverty. As India stands on the brink of a diabetes epidemic due to the rapid increase in population, increased longevity, high ethnic susceptibility to diabetes, rapid urbanization and changes from a traditional lifestyle, it is imperative that the government takes major steps (Fernandes and Fernandes, 2017).

Diabetes is a lifelong disease that increases the risk of multiple morbidities due to higher blood sugar levels, overweight, substance use and lack of exercise (Bansode and Prasad, 2022). Undiagnosed individuals are not aware of the increased risk of developing diabetes and its related complications (Beagley et al., 2014). Additionally, the disease and its complications cause a heavy economic burden for diabetics, their families and the society as a whole (Rao et al., 2002). Studies have shown that the direct and indirect costs of diabetes are significant worldwide. Direct expenses include medical and non-medical costs for people with diabetes with most of the burden falling on individuals and families. Indirect costs are related to the society and the government, including loss of productivity. The costs of diabetes care have increased due to the presence of multiple morbidities among diabetes patients. These high expenditures place a significant burden on both patients and state resources (Bansode and Jungari, 2019).

The costs of treating diabetes affect all socioeconomic groups with households, particularly the poor, facing significant financial strain in treating cardiovascular diseases and diabetes (Singh, 2013). Healthcare delivery in India is shared by state-run institutions that offer free medical care, private institutions where patients have to pay for services, and a large number of medical practitioners. There are no restrictions on people attending different clinics in India, and those who can afford often prefer treatment from private centres. Government-run free hospitals are often crowded and staff members are overburdened, leading some low and middle-income groups to prefer private hospital care. However, the expenses incurred cause a severe financial burden (Ramachandran et al., 2002).

Various obstacles hinder access to healthcare services such as poverty, financial difficulties, scarcity of healthcare services and lack of support for diabetes management. Financial constraints are a major barrier to accessing healthcare services for women and elderly diabetic patients in India, resulting in irregular medication usage (Bhojani et al., 2013). Several studies have found that lower-income groups spend a larger proportion of their income on diabetes care (Yesudian et al., 2014). Although existing literature indicates that the cost of obtaining diabetic medical care is particularly distressing for lower-income households, there is still a dearth of studies that emphasize the implications of medical costs among agrarian households located in districts affected by natural disasters caused by climatic conditions. There is a need to introduce cost-effective treatment strategies to reverse this trend. Hence, this study is designed to estimate the economic burden at the individual and household levels of patients suffering from diabetes. Another important aspect of this study is to understand the relationship between the prevalence of diabetes and its economic burden on the population residing in the Latur district of Maharashtra, which is considered drought-affected.

II.   Data and methods

Data

The present study is based on empirical data collected from the Latur district of Maharashtra between May and November 2017. A total of 505 self-reported diabetes patients aged 18 years or older were interviewed for the study. To achieve the required representative sample size, the single proportional sample size formula was used. The prevalence of diabetes in the Latur district was obtained from the DLHS-4 factsheet which reported a prevalence of 14 per cent among the population aged 18 years and above. Considering a 95 per cent confidence interval, a margin of error of 4 per cent, a design effect of 1.5 per cent and a non-response rate of 10 per cent, the effective sample size was calculated to be 497. Rounded off, a total of 505 diabetic patients were interviewed for the study.

A multistage stratified random sampling technique was employed to identify the self-reported diabetic patients. For the study, two tehsils (Latur and Nilanga) were purposively selected. After selecting them, one urban ward and three villages as well as three census enumeration blocks (CEB) were chosen based on the proportion of population size (PPS) within each tehsil. Once the three CEBs from urban wards and three villages were selected, mapping and listing were conducted to identify adults aged 18 or above with diabetes. Subsequently, 42 self-reported diabetic patients from each CEB/village were randomly selected. In all, six CEBs and six villages were selected from the two tehsils.

Inclusion and exclusion criteria for sample selection

Individuals below 18 years of age, gestational diabetics and those who were seriously ill were excluded from it. Individual 18 years or above with Type 1 or Type 2 diabetes were interviewed for the study.

Outcome variables

The direct and indirect health expenditure were the main outcome measures of the study. Direct health expenditure was defined as the health expenditure incurred on doctor's fees, medical costs and transportation costs in the last one month. Indirect health expenditure is defined as the monetary value of man-days lost due to absence from work in the last one month. Further, Percentage share of health expenditure in household income (PSHEHI) on the diabetic persons was also calculated and considered as outcome variable of the study.

Independent variables

Respondents' age (18-40, 41-59, 60 years and above); place of residence (urban and rural); religion (Hindu, Muslim, Buddhist and others) education (illiterate, 1-9 years and 10 and above years); caste (scheduled castes/tribes, other backward classes (OBCs) and general); marital status (married and unmarried, divorced/separated) and wealth index (poor, middle and rich) have been included in the study as independent variables.

Data analysis

Data entry was conducted using the SPSS software (version 22) and statistical analysis was performed using STATA software (version 13.1). Descriptive statistics such as percentages, mean, and chi-square tests and multiple linear regression models were used to describe the variation in health expenditure by respondent's socio-economic characteristics.

III. Results

Demographic and socio-economic characteristics of the studied participants

Table 1 presents the demographic and socio-economic profile of the diabetic patients. It is evident that an almost equal number of respondents were from rural and urban areas. The majority of the respondents were males aged 60 years and above, currently married and with an educational attainment of 1-9 years. Majority of the respondents belonged to the Hindu religion and the general caste groups. Additionally, most of the respondents were not engaged in any work at the time of survey.

Table 1: Distribution of participants by their demographic and socio-economic characteristics, Latur, Maharashtra (2017)

Background characteristics	%	N
Locality		
Rural	49.9	252
Urban	50.1	253
Sex		
Male	56.2	284
Female	43.8	221
Age (years)		
18-40	16.4	83
41-59	37.4	189
60 and above	46.1	233
Marital status		
Currently married	78.2	395
Widowed/divorced/separated/Never married	21.8	110
Education status		
Illiterate	34.5	174
1-9 years	36.4	184
10 and more	29.1	147
Religion		
Hindu	70.9	358
Muslim	17.8	90
Buddhist and others	11.3	57
Caste		
SC/ST	26.9	136
OBCs	22.8	115
General	50.3	254
Working status		
Currently not working	50.7	256
Farmer/daily wage labour	22.6	114
Others	26.7	135
Wealth index		
Poor	33.3	168
Middle	33.5	169
Rich	33.3	168
Total	100	505

Health care expenditure of diabetes

In Table 2, the average monthly household health expenditure on the treatment of diabetic patients is displayed based on their socio-economic and demographic characteristics. The results show that the average monthly expenditure on diabetic patients in the study was approximately Rs. 1451/-. Urban areas had higher expenditure compared with rural areas. Furthermore, patients with 10 years or more of education and belonging to the general caste category had higher expenditure. Diabetic patients from poorer households spent on an average of Rs. 1387/- per month on treatment, while patients from richer households spent around Rs. 1518/- per month. Regarding the place of treatment, the expenditure was comparatively lower among diabetic patients seeking treatment from government hospitals (Rs. 1068/- per month) than those seeking treatment from private hospitals (Rs. 1552/- per month).

Table 2: Average health expenditure of the diabetic persons by their socio-economic and demographic characteristics, Latur, Maharashtra (2017)

Background characteristics	Mean	SD ($\pm$)	N
Locality			
Rural	1252.8	513.8	252
Urban	1460.7	699.3	253
Sex			
Male	1460.7	699.3	252
Female	1441.7	722.0	253
Age (years)			
18-40	1559.4	711.5	83
41-59	1447.3	666.0	189
60 and above	1415.8	742.7	233
Marital status			
Currently married	1425.9	679.3	395
Widowed/divorced/separated/never married	1541.9	808.1	110
Education status			
Illiterate	1371.6	681.9	174
1-9 years	1447.2	737.3	184
10 and more	1550.4	700.6	147
Religion			
Hindu	1457.0	718.5	358
Muslim	1369.7	639.3	90
Buddhist and others	1543.4	760.0	57
Caste			
SC/ST	1451.9	710.9	136
OBCs	1320.5	614.6	115
General	1510.0	743.9	254
Working status			
Currently not working	1455.3	711.6	256
Farmer/daily wage labour	1408.7	653.9	114
Others	1479.2	755.0	135
Wealth index			
Poor	1387.1	650.6	168
Middle	1448.5	661.5	169
Rich	1518.0	806.0	168
Hospital facility			
Government	1068.3	606.8	97
Private	1542.2	703.1	408
Total	1451.2	710.1	505

Table 3 illustrates the percentage share of health expenditure on diabetic persons in total household income (PSHEHI) based on demographic and socio-economic characteristics. The PSHEHI for the treatment of diabetes was the highest in rural localities (26.4%) compared with urban localities (18.8%). Marital status showed that currently married respondents had a PSHEHI of 21.4 per cent on the treatment of diabetes, while it was 26 per cent among the widowed and unmarried/separated/divorced categories. The illiterate category accounted for 26.3 per cent of the household income spent on healthcare for diabetes patients. Regarding the wealth index, poor patients allocated around 30 per cent of their household income to the treatment of diabetes, while rich patients allocated approximately 15 per cent. Overall, 22.6 per cent of the PSHEHI was dedicated to diabetes treatment among the sample population.

Table 3: Percentage share of health expenditure in household income (PSHEHI) on the diabetic persons by demographic and socioeconomics characteristics, Latur, Maharashtra (2017)

Background characteristics	%	N
Locality		
Rural	26.4	252
Urban	18.8	253
Sex		
Male	22.2	284
Female	23.0	221
Age		
18-40	24.9	83
41-59	21.4	189
60 and above	22.7	233
Marital status		
Currently married	21.4	395
Widowed/divorced/s\separated/never married	26.9	110
Education status		
Illiterate	26.3	174
1-9 years	19.5	184
10 and more	22.0	147
Religion		
Hindu	21.5	358
Muslim	23.2	90
Buddhist and others	28.4	57
Caste		
SC/ST	24.1	136
OBCs	22.1	115
General	22.0	254
Working status		
Currently not working	23.5	256
Farmer/daily wage labour	21.2	114
Others	22.0	135
Wealth index		
Poor	30.3	168
Middle	22.6	169
Rich	14.9	168
Hospital facility		
Government	22.5	97
Private	22.6	408
Total	22.6	505

Table 4 presents the results of multiple linear regressions to determine the factors associated with the log percentage share of health expenditure (PSHEHI) on the monthly treatment of diabetes among diabetic patients in the Latur district. Locality, age, years of education, religion and wealth index were significantly associated with log PSHEHI in the household income of diabetes patients (P<0.001). Individuals living in urban areas had 33 per cent lower log PSHEHI on diabetes treatment compared with those in rural areas. Log PSHEHI was 25 per cent lower among individuals with an educational attainment of one to nine years compared with illiterate individuals. The findings indicate a significant association between age and log PSHEHI (P<0.05). The age group of 60 years and above had 27 per cent lower PSHEHI on monthly treatment compared with the 18 to 40 age group of diabetic patients. Moreover, the results revealed that diabetic patients belonging to middle and rich household categories had 33 per cent and 75 per cent lower log PSHEHI on monthly treatment respectively compared with patients from poor categories (P<0.001). Furthermore, diabetic patients relying on oral medication had 49 per cent lower log PSHEHI on monthly treatment

compared with those dependent on insulin treatment (P<0.001). The log PSHEHI on diabetes treatment was 35 per cent higher among individuals belonging to Buddhist and other religions compared with the Hindu religion (P<0.001).

Table 4: Result of multiple linear regression models showing the effect of background characteristics on monthly log PSHE in household income of the diabetic persons

Background characteristics	Coefficient	95% Conf. Interval	
		Lower	Upper
Locality			
Rural®			
Urban	-0.33***	-0.48	-0.19
Sex			
Male®			
Female	0.05	-0.13	0.23
Age (years)			
18-40®			
41-59	-0.13	-0.34	0.08
60 and above	-0.27**	-0.51	0.04
Marital status			
Currently married®			
Widowed/divorced/separated/never married	0.10	-0.1	0.3
Education status			
Illiterate®			
1-9 years	-0.25***	-0.44	-0.06
10 and more	-0.05	-0.27	0.18
Caste			
SC/ST®			
OBCs	0.02	-0.21	0.25
General	0.12	-0.09	0.32
Religion			
Hindu®			
Muslim	0.15	-0.04	0.35
Buddhist and others	0.35***	0.09	0.61
Working status			
Currently not working®			
Farmer/daily wage labour	0.00	-0.21	0.2
Others	-0.09	-0.29	0.11
Wealth quintile			
Poor®			
Middle	-0.33***	-0.51	-0.15
Rich	-0.75***	-0.93	-0.58
Daily treatments			
Insulin dependant®			
Oral medication	-0.49***	-0.68	-0.3
Diagnostic with morbidities			
No®			
Yes	0.14	-0.01	0.29
Every day exercise			
No®			
Yes	0.06	-0.09	0.21
Substance use			
No®			
Yes	0.05	-0.12	0.21
_cons	3.93	3.48	4.37
R-squared =0.2660			

Note**:** Level of significant: *** p<0.01; **p <0.05; *p<0.10; ®: reference category.

Figure 1: Percentage distribution of working days lost by working diabetes patients according to their background characteristics
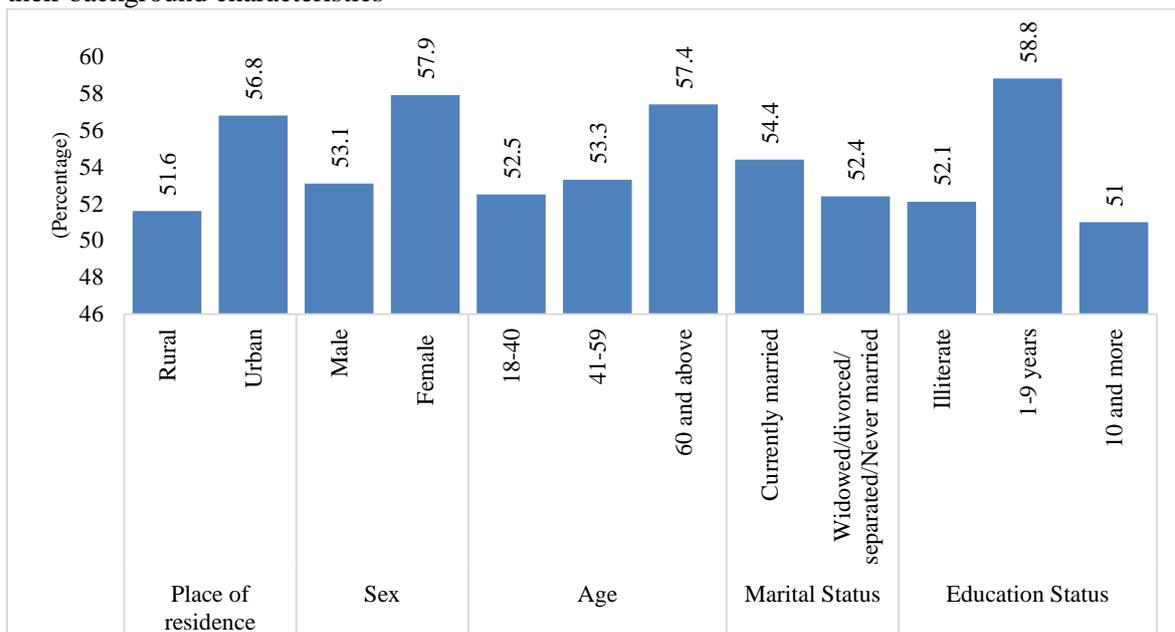

Figure 1 shows the percentage distribution of work days lost by working diabetes patients by place of residence, gender, age group, marital status and education status of the participants. It shows that 56 per cent of working days are lost by diabetics in urban areas, while 56.8 per cent of working days are lost in rural areas. Women reported a higher percentage of work days lost by working diabetes patients, 57.9 per cent compared with 53.1 per cent for men. Age group of patients with diabetes indicates a positive effect of age group on lost work days among patients with diabetes. As age increases, the percentage of work days lost by working diabetics also increases. Among age groups, 18-40 year olds lost 52 per cent, 41-59 year olds 53 per cent and 60 years and older lost 57 per cent of work days. Currently married participants saw a higher prevalence at 54.4 per cent. Education status of patients with diabetes revealed that across education status categories, diabetes patients with 1–9 years of education had the highest proportion of working days at 58 per cent. By comparison, the proportion of lost work days was 51 per cent among illiterate patients and 52 per cent among those with 10 or more years of education.

Figure 2: Percentage distribution of working days' loss among working diabetes patients according to socio-economic characteristics
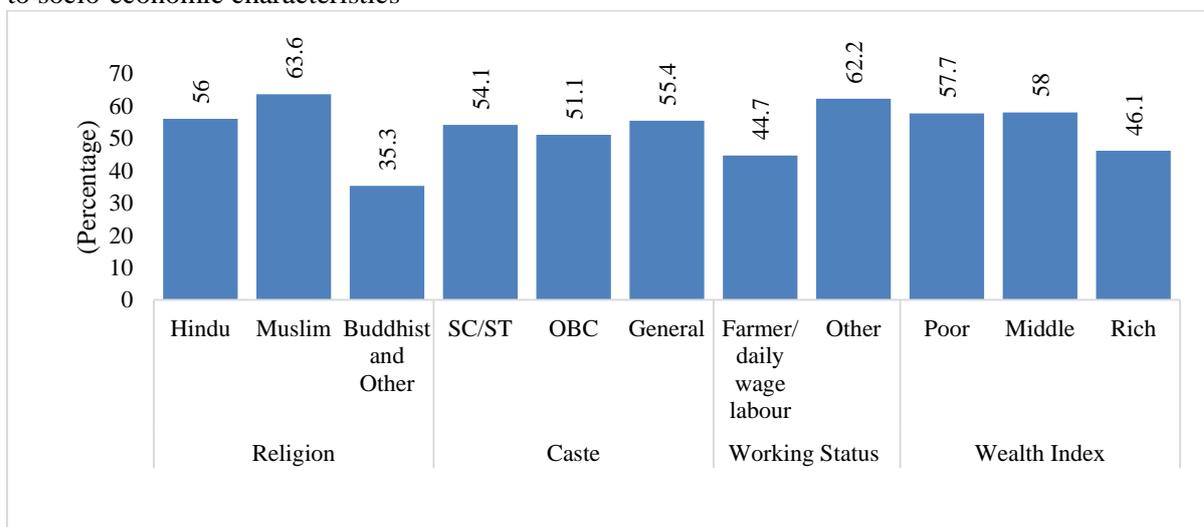
Figure 2 presents the percentage distribution of working days lost by diabetes patients based on socio-economic characteristics. The analysis of religion reveals that 63 per cent of working days were lost among individuals belonging to the Muslim religion, whereas Buddhist and others accounted for less than 35 per cent of working days lost. When considering the working status, farmers and daily wage labourers with diabetes experienced a loss of 44 per cent of working days, while other occupational categories reported a higher percentage of 62 per cent working days lost. Furthermore, among different wealth categories, 58 per cent of working days were lost among individuals from the poorer and middle-class categories, while the rich category experienced a lower percentage of 46 per cent working days lost.

Table No. 5 presents the indirect health expenditure in terms of working days lost due to diabetes illness among working respondents. On an average, diabetic patients in urban areas experienced a loss of three working days, while those in rural areas reported an average of two working days lost. Among respondents, the average number of working days lost was two for both illiterate individuals and those with ten or more years of education. Interestingly, respondents who identified as Buddhist or followed other religions reported an average of four working days lost due to diabetes illness, whereas Hindu respondents reported two working days lost in the last month.

Table 5: Average indirect monthly health expenditure of working diabetic persons by demographic and socioeconomics characteristics, Latur, Maharashtra (2017)

Background characteristics	Working days loss		Per day income		Indirect expenditure		N
	Mean	SD(±)	Mean	SD(±)	Mean	SD(±)	
Locality							
Rural	2.3	2.4	239.3	302.0	572.6	998.2	124
Urban	2.8	2.1	251.2	270.9	780.3	1344.0	125
Sex							
Male	2.8	2.6	283.2	309.7	826.1	1332.7	192
Female	1.8	0.9	129.3	137.8	235.9	285.1	57
Age (years)							
18-40	3.0	3.6	206.4	172.8	785.9	1772.2	61
41-59	2.4	1.9	282.0	350.5	666.9	980.9	120
60 and above	2.6	1.4	218.0	232.6	620.9	920.3	68
Marital status							
Currently married	2.6	2.4	255.8	293.3	720.3	1235.7	228
Widowed/divorced/separated/never married	1.9	0.3	130.3	120.6	248.5	244.2	21
Education status							
Illiterate	1.8	0.7	152.7	126.8	274.7	263.8	48
1-9 years	2.5	1.5	243.6	298.5	647.6	915.3	97
10 and more	3.0	3.2	291.6	315.7	910.7	1611.9	104
Religion							
Hindu	2.5	2.2	266.7	299.2	719.4	1261.3	182
Muslim	2.2	1.1	127.0	73.3	301.6	250.2	33
Buddhist and others	3.9	3.7	273.3	355.6	1028.1	1480.7	34
Caste							
SC/ST	2.6	2.3	338.6	410.4	791.2	1063.0	74
OBC	2.1	1.3	182.1	132.3	393.9	413.4	45
General	2.7	2.5	214.2	219.7	713.1	1406.2	130
Working status							
Farmer/daily wage labour	2.8	2.9	154.9	88.1	489.5	789.5	114
Others	2.4	1.9	300.7	344.1	798.6	1373.0	135
Wealth index							
Poor	2.4	2.7	211.3	198.8	514.0	784.5	85
Middle	2.5	1.5	268.4	322.9	746.9	1047.0	88
Rich	2.8	2.7	260.5	329.2	821.9	1749.3	76
Total	2.6	2.3	245.6	285.0	681.8	1192.9	249

Furthermore, the findings revealed the average indirect health expenditure in terms of monetary values for working days lost due to diabetes illness in the last month. Among working respondents in urban areas, the average monthly indirect expenses amounted to Rs. 780/-, while in rural areas, it was Rs. 572/-. In terms of educational status, respondents with ten or more years of education had an average monthly indirect expenditure of Rs. 910/-, whereas illiterate respondents reported an average of Rs. 274/-. The indirect health expenditure by wealth index indicated higher expenses among the rich category (Rs. 821/-) compared with the poor category (Rs. 514/-). Moreover, the average monthly indirect health expenditure among all working respondents was found to be Rs. 681/-.

IV.   Discussion

The study indicates that a significant portion of diabetic patients falls within the age group of 60 years or above with a majority being illiterate and not currently employed. This may be attributed to lower levels of awareness and reduced physical activity among the elderly population. However, it's important to note that age is a non-modifiable risk factor associated with an increased risk of diabetes (Mather and Keen, 1985; Allawi, 1988; Shi, 2001).

Furthermore, the percentage share of health expenditure in household income is higher (around 25%) among individuals aged 18 to 40 years compared with those in the age groups of 41-59 years and 60 years or above. This could be due to a higher prevalence of insulin-dependent diabetes and frequent hospital visits for sugar tests in the younger age group. The cost of insulin is typically higher than that of oral medication (Bastida et al., 2017).

The study also highlights variations in average monthly expenditure among diabetic individuals. In rural areas, the average monthly health expenditure lower than the urban areas. Additionally, the wealth index composition indicates that average health expenditure on diabetes is higher among individuals in the rich category compared with those in poor households. This could be attributed to several factors such as limited access to hospitals and qualified doctors in rural areas, financial constraints, poverty, transportation challenges and lack of well-equipped government hospitals (Fernandes & Fernandes, 2017).

Moreover, the study identifies that the PSHEHI is higher among rural residents, illiterate individuals and those from poor socio-economic backgrounds. This disparity can be attributed to their low socio-economic status, poverty and limited availability of healthcare facilities (Fernandes & Fernandes, 2017).

Indirect health expenditure is higher among working diabetic patients residing in urban areas, having completed ten or more years of schooling, following Buddhist or other religions and belonging to SCs/STs communities. Several factors contribute to this disproportionate distribution, including lack of awareness, illness, urban lifestyle, presence of multiple comorbidities and reduced likelihood of regular medical check-ups among working diabetic patients (Kapur, 2007). The study reveals a significant burden of treatment costs among diabetic patients, particularly among the rural population from socially disadvantaged backgrounds, characterized by low household income, economic inactivity and limited educational attainment. These individuals face significant challenges in accessing healthcare services and facilities.

V.   Conclusion

As the epidemiological burden of diabetes continues to increase, the economic burden on households is expected to rise disproportionately affecting the economically disadvantaged segments of the society. Diabetes has a detrimental impact on the economic status of both individuals and households. Since it is a lifelong disease, individuals have to bear the expenses of medication throughout their lives. Therefore, it is crucial for the government and private stakeholders to take

proactive measures in implementing diabetes prevention and disease management programmes at all community levels.

Furthermore, special attention needs to be given to families in the drought-hit Latur district which have low educational background, lack social development and come from economically weaker sections of the society. Programmes should be designed to provide them access to quality healthcare services and enable them to receive adequate healthcare. In order to achieve the goal of equitable distribution of health outcomes and ensure financial risk protection for households, it is imperative to strengthen the existing health infrastructure including sub-centers, primary health centers and community health centers. These facilities should be equipped with blood sugar testing capabilities and provide affordable access to medication for diabetes patients. This approach would reduce transportation costs and expenses associated with consultations and medication for diabetic patients.

Additionally, there is a need to implement community health insurance schemes that specifically cater to the healthcare needs of vulnerable populations such as the poor, illiterate and elderly diabetes patients. These schemes should provide subsidized healthcare services to alleviate the financial burden on these individuals.

In conclusion, addressing the challenges posed by diabetes requires a comprehensive approach that focuses on strengthening healthcare infrastructure, improving accessibility and affordability of essential services, and implementing targeted programs for vulnerable populations. By taking these measures, we can enhance the overall well-being of individuals with diabetes and promote equitable health outcomes.

Ethical issues

This work is based on the Ph.D. work of the first author. The ethical clearance was taken from the Student Research Ethics Committee of the International Institute for Population Sciences Mumbai. The consent to participate has also been obtained from each of the respondents before starting the interview.

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