

Healthcare utilisation and out-of-pocket expenditure of type 2 diabetes patients with and without comorbidity: A study in primary care in Bhubaneswar, India.

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Research article

Keywords: type 2 diabetes mellitus, comorbidities, out-of-pocket expenditure, healthcare utilisation

Posted Date: July 6th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-18072/v2>

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Abstract

Background: Globally, non-communicable diseases (NCD) demand a higher healthcare expenditure. Amongst the NCDs, diabetes mellitus, is often associated with multiple, co-existing chronic conditions. In low- and middle-income countries where most of the healthcare expenditure is borne out of pocket, diabetes management may pose a significant financial stress.

Methods: A cross-sectional study was conducted in 17 urban primary healthcare facilities of Bhubaneswar to assess the healthcare utilisation and out-of-pocket expenditure among type 2 diabetes patients attending these facilities. Healthcare utilisation was determined by the number of visits to healthcare facilities in the last six months, and out-of-pocket expenditure was assessed by outpatient consultation fees, medicines, travels to health care facilities and diagnostic tests. Total out-of-pocket expenditure was defined as the sum of these costs.

Results: The median number of visits in 6 months for diabetes patients with any comorbidity was 4 and 5 for diabetes patients with more than 4 comorbidities. Among the comorbid conditions, depression, stroke, auditory impairment and acid peptic disease were associated with higher healthcare utilisation. The total out-of-pocket expense was 2.3 times higher among diabetes patients with any comorbid condition compared to patients with diabetes only. The total median expenditure was higher for diabetes patients having stroke, heart diseases, kidney diseases and cancer compared to other comorbid conditions. The association of comorbidity in diabetes patients with health care utilization and out-of-pocket expenditure is statistically significant after adjustment for sociodemographic characteristics and diabetes duration.

Conclusion: Considerable expenditure is incurred by diabetes patients attending primary healthcare facilities for the management of diabetes and other chronic conditions. This is a significant burden for diabetes patients below the poverty line and with limited or no insurance cover. There is a need to increase the coverage of insurance schemes to address the chronic conditions management expenditure of outpatients.

Background

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder associated with morbidity, disability and premature mortality. Diabetes Mellitus (DM) patients frequently suffer from complications and related or unrelated comorbidities. [1,2] The debilitating nature of DM is associated with significant direct and indirect costs for treatment, managing complications and comorbidities. The increased use of healthcare resources with the presence of comorbidities is well established. [3] Struijs et al., for example, have inferred that different comorbid conditions have different effects on healthcare utilization and that diabetes patients with non-vascular comorbidities have similar amount of healthcare needs as those diabetes patients with vascular comorbidities, while diabetes patients without comorbidity use less care compared to those with comorbidity. [4]

Among low- and middle-income countries (LMIC) like India, where almost two-thirds of healthcare financing is out-of-pocket, diabetes patients face an enormous cost burden. The absence of any cover or minimal insurance policies further amplify their costs and jeopardize their access to the necessary healthcare.[5] Bhojani et al concluded in their study in a poor urban neighbourhood in South India that due to the out-of-pocket spending on their chronic conditions management the number of people living below poverty line were doubled in one month, with further worsening of their poverty.[6] Attaei et al. in their study observed a decline in adherence to medicines with an increase in out-of-pocket expenses, and improved adherence with low out-of-pocket expenditures and enhanced insurance coverage including medicine costs.[7] With a rapidly growing number of diabetes patients in India, the burden of DM on total healthcare expenditure is likely to increase and, potentially, will have important consequences for the sustainability of healthcare.[8] This poses a challenge to the strengthening of the Indian healthcare system and the government's plan to achieve universal health coverage by 2022.[9]

The Rashtriya Swasthya Bima Yojana (RSBY) or National Health Insurance Programme launched by the Indian Ministry of Labour and Employment (currently under the purview of the Department of Health and Family Welfare) [10] to provide insurance coverage for inpatient care to 'Below Poverty Line' families and the unorganized labor force does not cover outpatient care expenses. Past studies have also proved that non-inclusion of expenditure on medicines, laboratory testing and outpatient visits has limited the role of RSBY in mitigating financial risk among the beneficiaries. [11]

Though extensive studies have been carried out in Europe to look into the effects of comorbidity on healthcare expenditure and healthcare utilisation among diabetes patients attending different levels of healthcare, such studies are few and far between in the Indian subcontinent. In LMIC settings where the population still depend on the primary care health facilities for the routine management of their chronic conditions, there is a need to explore the costs related to manage diabetes and comorbidities by diabetes patients. The present study aims to provide an overview of the healthcare utilisation and out-of-pocket expenditure of diabetes patients attending primary health care facilities in Bhubaneswar, India. We examined the impact of comorbidity on healthcare utilisation and costs borne by diabetes patients and the effects of different comorbidities on health care utilisation and out-of-pocket expenditures.

Methods

Study design and setting

A cross-sectional interview survey was conducted in all 17 urban primary healthcare centres in Bhubaneswar, the capital city of Odisha with a population of 900,000 inhabitants. [12] The National Sample Survey Office (NSSO) in its report on social consumption of health has indicated that the public healthcare facilities in Odisha provide almost 72% of outpatient care for the population of the state. [13] The public health care system has a three-tier structure (primary, secondary and tertiary levels). Primary Health Care Centres are involved in delivering primary care while district hospitals and sub-divisional hospitals provide secondary care. Tertiary health care is provided by medical college hospitals.

Study participants

The data collection for the present study was conducted between September 2014 and February 2015 at the public primary healthcare facilities. The inclusion criteria for the study was type 2 diabetes patients (diagnosed as type 2 diabetes mellitus by a physician) with a diabetes duration of more than six months. Keeping in consideration the limited consultation hours in the healthcare facilities, every third eligible diabetes patient was approached to participate in the study. The inclusion criterion of at least six months of diabetes duration was applied for the diabetes patients as we needed information about healthcare utilisation for diabetes. The exclusion criteria for the study were severely ill diabetes patients or with acute health problems. Anonymised details of all diabetes patients who were excluded (age, gender, reason for exclusion) from the study, were recorded to compare the characteristics of the participants with the non-participants.

Measurements

The participants of the study were interviewed in a separate private room in the primary care facility using a predesigned and pretested questionnaire, *Diabetes Co-morbidity Evaluation Tool in Primary Care (DCET-PC)*. The DCET-PC is derived from "Multimorbidity Assessment Questionnaire for Primary Care", a validated questionnaire which was pretested and the feedback used to adapt the questionnaire for our study. [14] Two graduate nurses trained in patient history-taking and interview techniques carried out the interviews, and 10% of the interviews were done in the presence of the first author. The DCET-PC (Appendix 1) included questions about the existence of comorbid conditions, eliciting information on whether the patient had any of the 16 listed chronic conditions, and socio-demographic details, i.e. age, sex, residence (rural, semi-urban, urban), ethnicity (general, scheduled caste and tribe, other backward classes), religion (Hindu, Muslim, Christian, others), educational level (no education, primary level, secondary, graduate and above), marital status (single, married), annual family income (categorised into five quintiles) and household status (above poverty line, below poverty line). The details of development and domains of the DCET-PC questionnaire were described in our previous paper. [1]

We estimated comorbidity in three ways: 1) presence or absence of any comorbidity, which was further categorised into 2) the number of comorbid conditions (zero, one, two, three, four or more chronic conditions), and 3) the presence of any one of the 15 chronic conditions (hypertension, acid peptic disease, back pain, arthritis, lung disease, visual impairment, auditory impairment, heart disease, stroke, kidney disease, epilepsy, cancer, thyroid disorder, obesity, depression) in our study in one individual patient. Healthcare utilisation was operationalized as the reported number of visits to any healthcare facility in the last six months for any reason. Out-of-pocket expenditure was measured in Indian Rupees (INR) by asking about expenses incurred in the last six months separately for outpatient consultation fees, medicines (for DM and other diseases separately), travelling to those healthcare facilities, and diagnostic tests (for DM and other diseases separately). Total out-of-pocket expenditure was defined as the sum of these costs.

Analysis

To estimate the healthcare utilization, due to the skewed nature of the data, median (interquartile ranges) number of visits done by the patient to any healthcare facility during last six months were calculated. Healthcare utilization and out-of-pocket expenditure were further described across the number of comorbid conditions and the prevalence of leading comorbidities. Bivariate comparison was performed using a Kruskal Wallis test for quantitative data (on the basis of median values) and a chi-square test for categorical data. Furthermore, we calculated the median and interquartile ranges of out-of-pocket expenditure by comorbidity status (Yes/No). The difference in mean out-of-pocket expenditure and healthcare utilization across the comorbidity groups was tested using Wilcoxon signed rank test.

Poisson regression model in multilevel mixed effects methods was used with two levels (health center and patient) for multivariate analysis to assess the independent contribution of comorbidity on healthcare utilization and out-of-pocket expenditure. The collinearity between the variables was tested before including them in multivariate analysis. Adjusted incidence rate ratio was calculated for each predictor for estimating health care utilization and expenditure. A p-value of <0.05 was considered statistically significant. Analyses were performed in STATA Corp-12 Tx.

Results

Participants

We approached 942 diabetes patients, of whom 912 (97%) consented to be interviewed. The reasons cited for not participating were lack of time and unwillingness to answer. Of all respondents, 575 [63%] were male. The highest number of respondents was in the age group 40–69 years (N = 766 [83%]). The mean age of the respondents was 55 years. The mean number of health facility visits was 7.1 [SD: 11.7]. The mean total healthcare expenditure was INR 2,653 [SD 2,975]. Nearly 84% of patients had comorbidity, 29% had a single comorbidity, 25% had two comorbidities, 17% reported having three, and 14% had four or more comorbidities [Table 1].

Health care utilisation

The median number of visits of diabetes patients without any comorbidity in 6 months was 5 (IQR=5) and 4 (IQR=4) for patients having any comorbidity and 5 (IQR=5) for diabetes patients with four or more comorbidities. [Table 2]. Among diabetes patients with comorbidity the median number of visits was highest for patients with depression 6 (IQR=4), acid peptic disease (APD) 6 (IQR=5), auditory impairment/deafness 6 (IQR=5), stroke 6 (IQR=17), followed by thyroid disease 4.5 (IQR=5) cancer 4.5 (IQR=5) and visual impairment/blindness 4 (IQR=5) [Table 4].

Out-of-pocket expenditure

We found a linear increase in total expenditure along with costs for medicines on diabetes, medicines for other diseases, and laboratory testing for other diseases with the number of comorbidities, which was statistically significant [Table 3]. No significant association was found between expenditures for travels

to hospital and laboratory investigation for diabetes, and the number of comorbid conditions. Patients with any comorbidity spent two times more compared to those having no comorbidity. Diabetes patients with any comorbid condition had a two times higher expenditure for medicines (for diabetes and comorbidity) than patients with only diabetes. Among diabetes patients having one chronic condition the median total expenditure ranged from 1,565 INR to 4,220 INR. The total median expenditure was higher for patients having stroke, heart diseases, kidney diseases and cancer compared to other comorbid conditions [Table 3].

Multivariate analyses

Multivariate adjusted multilevel mixed effect Poisson regression analyses showed a strong positive association of diabetes patients with comorbidities with healthcare utilisation [RR 1.33; 95% CI 1.24-1.43] and out of pocket expenditure. [RR 1.97; 95% CI 1.96-1.98] [Table 4] compared to diabetes patients without comorbidity.

Discussion

The present study assessed the healthcare utilization and out-of-pocket expenditure among diabetes patients with and without comorbidities attending primary healthcare centres in India. Our study indicates the substantially larger number of visits to healthcare facilities among diabetes patients with comorbidity compared to those without comorbidity, which is similar to findings of prior studies outside India. [4,15] We also found that the largest proportion of the total out-of-pocket expenditure went on medicines. Sum et al. have also concluded in their study on multimorbidity and out-of-pocket expenditure that the costs of medicines contributed to a substantial share of total expenditure. [16] Another major finding of our study is that diabetes patients with any additional comorbidity had increased total out-of-pocket expenditure along with costs for medicines for diabetes, medicines for other diseases, and laboratory testing for other diseases. This expenditure increased with the number of comorbidities. The other finding of our study that diabetes patients above poverty line had a higher prevalence of comorbid conditions in comparison to diabetes patients from below poverty line is divergent from study findings from developed countries but similar to findings from studies conducted in India. [17,18]

Wang et al. in their study have also concluded that the number of visits to health facilities increased with increase in number of complications associated with diabetes. [3] Likewise, Grunier et al concluded that rise in the number of comorbid conditions raised the healthcare utilisation among diabetes patients. [19] Our study finding of higher healthcare utilisation among diabetes patients with comorbid conditions like APD, stroke, deafness and depression is similar to findings from other studies. [20,21]

Our finding of increase in expenditure due to comorbid conditions among diabetes patients is consistent with the results from previous studies in middle- and low-income countries.[23,24,25] Thakrar et al. concluded that the presence of an additional comorbid condition further enhances the cost burden among diabetes patients.[26] Similarly, Akari et al. analyzed the healthcare costs by calculating the direct and indirect costs of diabetes with comorbidities among hospitalized patients in a tertiary care hospital

and concluded that higher expenses were incurred by diabetes patients with three or more comorbidities and also those with macro-vascular complications.[27] Acharya et al. assessed the costs of illness for diabetes patients with or without complications hospitalized in a tertiary care hospital; they concluded that diabetes patients with renal and cardiac complications incurred greater expenses than those with other chronic complications. [28] These studies only investigated the cost of concordant comorbidities and complications associated with diabetes. As our study has taken into account both concordant and discordant comorbidities, comparability to these studies is limited. Piette and Kerr classified comorbid conditions as concordant or discordant and concluded that concordant conditions resulted in better diabetes care but the clinically dominant condition may lead to worse diabetes management. [29] Other studies from developed countries have also reported findings similar to the present study. [30,31]

Strengths And Limitations

This is the first study in India assessing the healthcare utilisation and out-of-pocket expenditure among diabetes patients attending primary health care facilities and also taking a wide range of comorbidities into account, i.e. both concordant and discordant comorbid conditions. The findings are generally representative of urban primary healthcare users in India.

Self-reported comorbidity status as reported by the patients is one of our study limitations. Patients who had not been diagnosed or had conditions which were not reported were not included. The exclusion of undiagnosed type 2 diabetes mellitus patients is the other limitation of this study. As it is a cross-sectional study, it shows associations but not causal relations.

Conclusion

The findings of our study bring forth the high expenditure incurred by diabetes patients with certain comorbidity patterns. In LMIC settings where most of the diabetes patients have limited resources, the understanding of these patterns of comorbid conditions can prove useful in guiding the primary care physicians in setting up treatment priorities and designing cost effective treatment strategies. Similarly, higher healthcare utilisation has been found among diabetes patients with specific comorbidities. A more detailed study of factors of the healthcare utilisation could help in designing interventions to minimize the avoidable visits and reduce the dependence on the healthcare facilities. Some of the interventions like increased household visits by trained community level health workers and teleconsultation of the diabetes patients with the primary care physicians could enhance self-management practices among diabetes patients, resulting in fewer visits to health facilities and thus lessening the burden on primary health facilities and physicians. Zulman et al in their study on comorbidity interrelatedness have highlighted the importance of comorbidity interrelatedness or clinical complexity and its effect on the quality of care. [32] Our findings of high costs and healthcare utilisation for specific comorbid conditions could also form a base for future study into the economic impact of comorbidity interrelatedness and solutions for affordable management of multiple chronic conditions.

The draft of India`s National Health Policy [33] states that 63 million people have been pushed into poverty due to out-of-pocket expenditure on healthcare. As India progresses towards Universal Health Coverage, the financial burden posed by comorbidity among diabetes patients needs to be considered in greater detail. The ICMR INDIAB study on diabetes by Anjana and colleagues have also confirmed the high prevalence of diabetes among the low socioeconomic sections in the urban areas. In the light of the findings of our study, this reiterates the need for a more comprehensive and robust policy to address out-of-pocket expenditures. [34] It is important to explore the various components of out of pocket expenditure and identify the components with maximum cost impact like medications, laboratory investigations or visit to numerous centres for management of different comorbid conditions. The indirect expenses like loss of wages and disability adjusted life years (DALY) should also be studied. Collecting data on glycated haemoglobin (HbA1c) could help in studying the impact of glycaemic control and healthcare utilisation and out-of-pocket expenditure.

The present study indicates higher healthcare utilization among diabetes patients with comorbid depression. With the government of India`s thrust to expand the National Mental Health Programme, [35] the provision of mental health counselors at the primary care level could go a long way towards better management. As our study suggests that diabetes patients with comorbidities incur considerable out-of-pocket expenses, even in public primary care facilities, it can be expected that the expenses will be higher in private healthcare facilities. Hence, increased insurance coverage that includes outpatient services would help in alleviating the expenditure burden.

Declarations

Ethics approval and consent to participate

Respondents were informed about the purpose of the study and the information used. We collected their signature or thumb impression on the informed consent form. The data were coded, and the identities of the respondents were kept confidential. The Odisha state research and ethics committee granted ethical approval for the study (letter no. 161/SHRMU dated 16/05/2014).

Consent for publication

Not applicable

Availability of data and materials

The data is available with the corresponding author, and can be made available on reasonable request and permission from State human resources management unit, Department of Health and Family Welfare, government of Odisha.

Competing interests

The authors declare they have no competing interests.

Funding

No external funding was received.

Authors contribution

SP and FGS have designed the study, SS has analyzed the data, MA and JB have interpreted the findings. All the authors have contributed to the writing of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors are grateful to all the participants of the present study and the department of Health and Family Welfare, Government of Odisha.

Abbreviations

NCD: Non-communicable disease

T2DM: Type 2 diabetes mellitus

DM: Diabetes mellitus

LMIC: Low and middle income countries

RSBY: Rashtriya Swasthya Bima Yojana

DCET-PC: Diabetes Co-morbidity Evaluation Tool in Primary Care

APD: Acid Peptic Disease

DALY: Disability adjusted life years

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Tables

Table 1 Basic characteristics of type 2 diabetes patients by comorbidity status (n = 912)

	Without co morbidity (n=146) % [95% CI]	With co morbidity(n=766) % [95% CI]
Age group (years)		
18-29	1.3[0.0-3.2]	0.1[0.0-0.4]
30-39	8.7[4.1-13.2]	6.3[4.5-8.0]
40-49	28.7[21.4-35.9]	20.3[17.4-23.1]
50-59	39.3[31.5-47.2]	33.4[30.1-36.7]
60-69	17.3[11.2-23.4]	29.5[26.2-32.7]
>=70	4.7[1.3-8.1]	10.5[8.3-12.6]
Gender		
Male	74.0[66.9-81.1]	61.0[57.5-64.5]
Female	26.0[18.9-33.1]	39.0[35.5-42.5]
Place of residence		
Urban	76.0[69.1-82.9]	78.4[75.5-81.3]
Semi Urban	8.7[4.1-13.2]	11.4[9.1-13.6]
Rural	15.3[9.5-21.1]	10.2[8.0-12.4]
Ethnicity		
Schedule Caste	14.7[8.9-20.3]	31.5[28.2-34.8]
Schedule Tribe	5.3[1.7-8.9]	13.1[10.7-15.5]
Other Backward Caste	22.7[15.9-29.4]	12.6[10.2-14.9]
Others	57.3[49.4-65.3]	42.8[39.3-46.3]
Socio-economic status		
Above Poverty Line	36.2[24.8-47.7]	70.5[66.4-74.6]
Below Poverty Line	63.8[52.3-75.2]	29.5[25.4-33.6]
Highest Education		
Illiterate	8.7[4.1-13.2]	8.4[6.4-10.3]
Primary	22.0[15.3-28.7]	16.0[13.4-18.6]
Secondary	32.7[25.1-40.2]	34.8[31.4-38.2]
University	36.7[28.9-44.4]	40.8[37.3-38.2]
Marital Status		
Single	13.2[10.8-15.6]	8.7[4.1-13.2]
Married	86.8[84.4-89.2]	91.3[86.8-95.5]

Religion		
Hindu	92.0[87.6-96.4]	88.4[86.1-90.6]
Other	8.0[6.6-12.4]	11.6[9.4-13.9]
Family history of diabetes mellitus		
Yes	10.7[5.7-15.6]	24.7[21.7-27.8]
No	89.3[84.4-94.3]	75.3[72.2-78.3]
Risk Factor: BMI		
Underweight	4.7[1.3-8.1]	2.1[1.1-3.1]
Normal	40.0[32.1-47.9]	20.0[17.2-22.9]
Overweight	19.3[13.0-25.7]	19.4[16.5-22.2]
Obese	36.0[28.3-43.7]	58.5[55.0-62.0]
Health facility visits in last 6 months		
Never	2.0[0.1-4.2]	1.0[0.3-1.8]
1-2 visits	26.7[19.5-33.8]	16.7[14.1-19.4]
3-4 visits	20.0[13.6-26.4]	36.4[32.9-39.8]
5-6 visits	24.7[17.7-31.6]	20.1[17.2-22.9]
7-8 visits	15.3[9.5-21.1]	12.4[10.1-14.8]
9 or more visits	11.3[6.2-16.4]	13.3[11.0-15.8]
Total expenditure		
<=1000 INR	48.1[39.9-56.0]	18.9[16.1-21.6]
1001-2000 INR	35.3[27.6-43.0]	30.6[27.3-33.9]
2001-3000 INR	9.3[4.6-14.0]	19.8[16.9-22.6]
> 3000 INR	7.3[3.1-11.5]	30.7[27.5-34.0]

Table 2 Healthcare utilization by number of comorbidities: median number and range.

Number of comorbidities	Number of visits to health facility in last 6 months Median (Range)
Zero	5 (0-55)
1	4 (0-56)
2	4 (0-59)
3	4 (0-46)
>=4	5 (0-57)
Total	4 (0-59)
Diabetes with any Comorbidity	4 (0-59)
Kruskal Wallis, F (P value)	F= 0.707 , (p= 0.587_)

Table-3 Out of pocket expenditure by number of comorbidities (median INR).

Number of comorbidities	Medicine Diabetes (median INR)	Medicine Other disease (median INR)	Travel to Hospital (median INR)	Test Cost for Diabetes (median INR)	Test Cost for Other diseases (median INR)	Total Expenditure (median INR)
Zero	500	0	50	300	0	1045
1	600	200	50	332	0	1400
2	800	500	40	300	0	2000
3	1000	500	40	300	200	2460
>=4	1000	1000	5	400	400	3110
Diabetes with any comorbidity	800	440	40	300	100	2030
Kruskal-Wallis test (F)	11.14, p<0.001	11.31, p<0.001	0.80, p=0.524	1.94, P=0.102	13.42, p<0.001	14.21, p<0.001

Table- 4 Healthcare utilisation and Out of pocket expenditure across comorbid condition.

Conditions Combinations	Number of visits in last 6 months Median(Range)	Total expenditure (In INR) Median (Range)
DM+ Hypertension (n=181)	4 (0-53)	2100 (115-25700)
DM+ Acid Peptic Disease(n=74)	6 (0-59)	1630 (115-25700)
DM + Obesity(n=54)	4 (0-55)	870 (0-9100)
DM+ Backpain (n=48)	4 (1-44)	2000 (450-7200)
DM+ Arthritis (n=39)	3.5 (0-59)	1715 (550-7200)
DM+ Visual impairment/Blindness (n=25)	4 (2-53)	1930 (280-5990)
DM+ Thyroid (n=22)	4.5 (2-59)	1980 (350-10150)
DM+ Lung Disease (n=16)	4 (2-12)	2030 (410-6900)
DM+ Heart Disease (n=13)	4 (2-52)	3600 (2600-16100)
DM+ Stroke (n=7)	6 (3-39)	4220 (800-10150)
DM+ Kidney Disease (n=6)	4 (2-9)	3168 (1740-18100)
DM+ Epilepsy (n=6)	3.5 (1-5)	1565 (350-2130)
DM+ Cancer (n=6)	4.5 (2-8)	2685 (1210-6020)
DM+ Deafness (n=5)	6 (2-8)	2480 (1200-21000)
DM+ Depression (n=3)	6 (4-8)	1860 (1300-2020)

DM: Diabetes Mellitus

Table 5- Predictors of Healthcare utilization and total out-of-pocket expenditure of diabetes patients (N=912) using multilevel mixed effect Poisson modelling; unadjusted and adjusted rate ratios (RR) and 95% Confidence Intervals (95%CI)

		Healthcare utilisation		Total Expenditure	
Variables	Categories	Unadjusted RR [95%CI]	Adjusted RR [#] [95%CI]	Unadjusted RR [95%CI]	Adjusted RR [#] [95%CI]
Comorbidity	Only Diabetes	Reference	Reference	Reference	Reference
	DM with Comorbidity	1.31[1.22- 1.40] *	1.33[1.24- 1.43] *	2.20[2.19- 2.21] *	1.97[1.96- 1.98] *

[#]adjusted for patient characteristics (diabetes duration, age, sex, educational status, income and marital status), *P value <0.05