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ASSESSMENT OF FINANCIAL BURDEN OF MEDICATION AND FOLLOW-UP CARE AMONG DIABETES MELLITUS TYPE 2 PATIENTS IN PUBLIC AND PRIVATE HOSPITALS OF SWAT

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Abstract

Background: Type 2 diabetes mellitus is a chronic metabolic disease that requires life-long treatment and regular check-up. Higher treatment expenses may be causing patient financial hardships, especially in low-resource areas. The financial burden is compounded by the cost of medication, diagnostic investigations, transportation and income loss.

Objective: To compare and evaluate the cost of medication and follow up care of type 2 diabetes mellitus among public and private hospitals of District Swat, Khyber Pakhtunkhwa, Pakistan.

Design: Quantitative, descriptive cross-sectional study with 385 patients of four selected hospitals of Swat was designed. The analysis framework used was convenience sampling and a structured questionnaire. Data were analyzed using descriptive statistics, and the chi-square test.

Results: The data comprised 154 public hospitals and 231 private hospitals. The average spending were PKR 50,753 in the last three to four months. Total expenditure was mostly on direct medical costs (78.4%). The mean expenditure among the private-hospital

participants (PKR 58,952) was higher than that of the public-hospital participants (PKR 38,455). The financial burden was more pronounced in the private-hospitals than in the public-hospitals (48.1% vs 28.6% respectively, $p<0.001$).

Conclusions: The findings showed high financial needs for diabetes management, especially in regard to diabetes medications and follow-up care. The amount spent was more in the private hospitals. Access to affordable medicines and accessible diagnostic services, and better financial protection, may minimize the economic difficulties associated with treatment.

Introduction

Diabetes mellitus is a long-term metabolic condition that occurs when the blood glucose level is too high due to decreased insulin production, insulin resistance or a combination of both. Type 2 diabetes mellitus (T2DM) is the most common type of diabetes and is a chronic condition that must be managed for life. Financial burden is an economic disadvantage which a patient and his/her relatives may face because of the cost of healthcare services. Medication costs consist of costs of oral antidiabetic drugs, insulin, glucose monitoring supplies, and drugs to treat complications of diabetes. Follow-up care involves medical consultation, laboratory testing, regular blood sugar checks and screening for diabetes-related complications. There are two main types of cost, direct medical costs are the cost of medicines, hospitalizations, laboratory tests and consultations, and direct non-medical costs are the costs of transport and other costs associated with healthcare. Indirect costs are losses of income, productivity, and loss of employment. Ongoing treatment and frequent visits lead to a significant burden on the patient's economic situation and their family [1,2].

The rising incidence of diabetes mellitus makes it one of the greatest health care problems in the world and has significant economic impacts. In 2024, around 589 million adults aged 20-79 years were living with diabetes, which is 11.1% of the world's adult population, according to the International Diabetes Federation. It is expected to grow to around 853 million by 2050. Pakistan has one of the highest diabetes burden in the world with nearly 34.5 million adults living with diabetes in 2024 while an estimated age-standardized prevalence of 31.4% in Pakistan. According to a population-based study done in 1,447 adults in urban and rural communities in District Swat, the prevalence of diabetes was 9.52% and prevalence of prediabetes was 21.4%. The Swat study was published in 2021 with data from 2018 to give an earlier estimate of the disease burden locally. As diabetes becomes more commonplace, there is growing need for drugs, laboratory tests, and routine care and monitoring. With an increasing number of people affected, there is a significant economic burden on the healthcare system and economically disadvantaged households [3–5].

Type 2 diabetes mellitus is a major public health problem, having been greatly exacerbated by population ageing, poor nutrition and dietary habits, physical inactivity, and obesity. In 2021, about 537 million adults lived with diabetes globally, and more were anticipated to exist in coming decades, according to Sun and co. According to the Global Burden of Disease Study 2021, nearly 529 million people in the world suffered from diabetes in 2021, of which about 96% had type 2.

The differences in these global estimates are due to differences in population coverage, diagnostic definitions and statistical methods. In 2021, the authors of a study estimated that an estimated 44.7% of adults with diabetes were not diagnosed. Failure to diagnose and disease management leads to an increased risk of cardiovascular disease, kidney disorders, retinopathy, neuropathy, and diabetic foot complications. Patients with these complications will need other drugs, special tests and frequent hospital visits. Financial problems are a major part of the burden of diabetes and its complications for patients and their families, and diabetes is a management challenge that never ends [6–8].

Diabetes mellitus is a major economic problem for health care systems, national economies and individual households globally. In 2024, the estimated worldwide cost associated with diabetes was USD 1.015 trillion for diabetes-related health care costs, according to the International Diabetes Federation (IDF). In their economic model, Chen and colleagues estimate the macroeconomic burden of diabetes in the world to be 10.2 trillion international dollars in 2020-2050, excluding informal caregiving costs. When the informally provided care costs were added to the estimation, the burden rose significantly. In 2019, about two billion people had financial difficulty due to out-of-pocket health expenditure, according to the World Health Organization and World Bank. In the low and lower middle-income countries catastrophic health expenditure has been recognized as a significant risk factor to financial stability. (Bolongaita, et al.). Patients who need to pay for a medication for their entire life and repeat check-ups can find it difficult to keep up with their healthcare costs. Costs of medical care, transportation costs and loss of income can also affect savings in the household and make them more vulnerable, which may lead to a decrease in the savings of the household [3,9-11].

Due to high prevalence and the continuous treatment of type 2 diabetes mellitus, Pakistan has a significant economic burden from the disease. Arshad et al. performed a cost-of-illness analysis, among 522 patients with type 2 diabetes, in Pakistan and found an average annual total cost of treatment of USD 235.1 per patient. The direct costs of the disease were $93.2%, the direct non-medical costs were $5.3% and the indirect costs were $1.5% of total costs. The greatest financial element was medication, which made up about 69.4% of total annual expenditure. Older age, longer disease duration, multiple complications and combination drug therapy were associated with increased treatment costs. Taimur et al conducted a scoping review that revealed significant diabetes-related challenges, including diabetes knowledge, diabetes treatment adherence,

glycemic control, and diabetes complications in Pakistani patients. From the studies reviewed, 44.7% to 86.4% of the patients reported poor glycemic control. These results highlight the significant financial burden of the care of diabetes patients whose financial resources are limited [12,13].

Patients with type 2 diabetes mellitus often have high healthcare costs, including the costs of their medications and the need for follow-up care. Patients with diabetes need to buy medicines regularly, monitor their blood glucose, have laboratory tests and clinical consultations. In Pakistan, Zafar et al. carried out a cross-sectional analysis of diabetic patients and found that the mean annual direct medical expenses is PKR 55,113. 42% of them reported they faced financial barriers to treatment adherence and 76% reported diabetes related productivity losses. Patients who have an economic problem may not buy medications, not attend their appointments, or not get recommended diagnostic evaluations. Individualized treatment, frequent monitoring, and financial barriers consideration in diabetes management are highlighted in the American Diabetes Association Standards of Care in Diabetes. Poor adherence and lack of follow-up care can raise the risk of poor glycemic control, and diabetes-related complications. Patients with long-term healthcare needs face significant financial burden due to the ongoing expenses of medicines, laboratory tests and medical visits [2,14,16].

Cost of diabetes management is of major concern in District Swat, KPK, as patients from rural and urban areas may have difference in the access to healthcare and contribution of cost of management in diabetes. Access to continuous diabetes care is often dependent on patients taking medicines, undertaking laboratory tests, seeing specialists and being transported. In the year 2025, Ahmad and his team carried out a cross-sectional study on 233 people suffering from type 2 diabetes at Saidu Group of Teaching Hospital in Swat. The study found that 73.4% were taking their medication as prescribed and 26.6% were not taking their medication as prescribed. The study's reported finding revealed that 43.5% of the respondents cited financial constraint as a cause for non-adherence. There was statistically significant association between monthly income and medication adherence ($p<0.001$). Most public hospitals offer subsidized health care services, and some private hospitals might charge more directly for consultations, laboratory tests and prescribed medicines. There was limited local comparative information available on the financial costs of medication and aftercare for patients seen in public and private hospitals in Swat [5,15].

The cost of type 2 diabetes mellitus (T2D) should be carefully evaluated as treatment costs can impact adherence to treatment, attendance at follow-up visits, and long-term diabetes management. The data from Pakistan reveals that significant amount of resources are being allocated to antidiabetic medications, diagnostic workup, and healthcare consultations. Financial constraints have been found to be a significant factor that correlates with non-compliance of diabetic patients with their medicines in District Swat. There is little published data comparing the financial impact of diabetes care in the public sector vs the private sector within the district. The objective of the present study was to determine the cost of medicines and cost of follow-up treatment expenses of type 2 diabetes mellitus patients visiting selected public and private hospitals of Swat. Treatment expenditure, consultation charges, laboratory investigation costs, transportation costs, and socioeconomic factors (financial difficulties) will be investigated. The results could be useful for health care providers, hospital administrators, and policy makers in recognizing the significant economic challenges to diabetes treatment. These financial problems can be addressed through better education and understanding, which can help provide treatment services for diabetics, better access to medications, improved follow-up care and overall access to healthcare services, at affordable prices.

Methodology

Study Design and Setting

A cross sectional research design, in a descriptive approach, was used to evaluate the financial burden of medication treatment and follow-up care of T2DM patients. Four hospitals of Swat district, Khyber Pakhtunkhwa, Pakistan were selected for the study. The hospitals selected for the study were Saidu Group of Teaching Hospitals (SGTH), Swat Institute of Medical Sciences (SIMS), Luqman International Hospital and Swat Medical Complex. The study aimed to evaluate the cost of medicines, consultation, laboratory investigation costs, transportation costs, and loss of income due to diabetes management.

Population and Sampling

The subjects were selected as people with type 2 diabetes mellitus who visited the selected hospitals for medication and follow-up. The sample size, n = 385, was determined at a 95 % confidence level with a 5 % margin of error with a Raosoft sample size calculator. A non-probability sampling technique was used to recruit participants and this was a convenience sampling technique. The sample distribution proposed involved 154 participants from public

hospital and 231 participants from three private hospitals. Eligible patients included those who had been diagnosed with diabetes for 1 year or more, who had HbA1C values of 6.5% or more. Patients who were too ill and those who refused to participate were excluded.

Data Collection Procedure

A structured questionnaire was used, with 21 items in five sections, for data collection. The data provided the sociodemographic information, clinical history, direct medical cost, indirect financial cost, transportation cost, and other treatment-related expense. Participants would be informed of the purpose of the study and consent to participate prior to it. Structured interviews with responses to be collected with voluntary participation and confidentiality.

Data Analysis Procedure

Data analysis was intended to be done with the aid of statistical package for the social sciences (SPSS) version 26.0. Categorical variables were summarized using frequencies and percentages, and continuous variables were summarized using means and standard deviations. Costs were added together to obtain total financial burden of which the direct medical costs, direct non-medical costs and indirect costs were combined. The spending trends were analysed across both the private and public sectors of healthcare. The results were presented in tables and figures to interpret.

4 RESULT AND ANALYSIS:

Sociodemographic and clinical parameters of 385 patients with type 2 diabetes mellitus are shown in Table. Of the 385 participants, 199 (51.7%) were male and 186 (48.3%) were female. The majority of the participants were married (74.5%) and 54.0% lived in rural areas. 33.2 per cent of the population reported to have secondary or higher secondary education, whereas 24.7 per cent had no education. People were most likely to work outside the family in self-employment, business or farming (29.9%) and 76.4% said they had no health insurance or financial assistance. The mean age was 51.9 ± 11.2 years, while mean monthly household income was PKR 68,379.2 ± 30,973.5. The mean size of households was 5.9 ± 2.7 persons per household. As far as clinical features are concerned, 56.4% were taking oral anti-diabetic medication, 24.7% were taking a combination of oral medicines and insulin, and 15.8% were taking insulin alone. The prevalence of diabetes-related complications was 39.2% and 46.8% of participants had received a diagnosis of diabetes for 6–10 years. In these findings, there was significant socioeconomic variation, treatment needs, and clinical characteristics among the participants.

Table 1. Sociodemographic and Clinical Characteristics of Patients with Type 2 Diabetes Mellitus (N = 385)

Characteristic	Category	n (%) / Mean ± SD
Gender	Male	199 (51.7)
	Female	186 (48.3)
Marital status	Married	287 (74.5)
	Widowed	55 (14.3)
	Single	30 (7.8)
	Divorced	13 (3.4)
Residence	Rural	208 (54.0)
	Urban	177 (46.0)
Education	Secondary/Higher Secondary	128 (33.2)
	Primary/Middle	108 (28.1)
	No formal education	95 (24.7)
	Graduate or higher	54 (14.0)
Occupation	Self-employed/Business/Farmer	115 (29.9)
	Housewife	95 (24.7)
	Employee	78 (20.3)
	Retired	55 (14.3)
	Unemployed	42 (10.9)
Health insurance/assistance	No	294 (76.4)
	Yes	91 (23.6)
Age (years)	Mean ± SD	51.9 ± 11.2
	Median (Range)	52 (30–78)
Monthly household income (PKR)	Mean ± SD	68,379.2 ± 30,973.5
	Median (Range)	63,000 (20,000–220,000)
Household size	Mean ± SD	5.9 ± 2.7

	Median (Range)	6 (2–10)
Current treatment	Oral medicines only	217 (56.4)
	Both tablets and insulin	95 (24.7)
	Insulin only	61 (15.8)
	Diet and exercise only	12 (3.1)
Diabetes-related complications	No	234 (60.8)
	Yes	151 (39.2)
Diabetes duration	1–5 years	123 (31.9)
	6–10 years	180 (46.8)
	More than 10 years	82 (21.3)

The direct and indirect costs of diabetes care for 385 patients over the previous 3-4 months are shown in able 4.5. Financial burden at overall mean level was PKR 50,752.4; of which the highest share was direct medical cost (78.4%), followed by direct non-medical cost (14.9%) and indirect cost (6.6%). The median value of direct medical expenditure was PKR 39,813 ± 15,053 in which the highest individual expenditure was on medicines and testing supplies (PKR 24,699), followed by laboratory investigations (PKR 10,052), physician consultation (PKR 4,211) and hospital charges (PKR 850). The mean direct non-medical expenditure was PKR 7,583 ± 2,903; among which transportation was the highest expenditure (PKR 5,145). The mean indirect financial loss was PKR 3,356.4 ± 3,198.6 which includes inpatient income losses (PKR 1,863.9) and caregiver income loss (PKR 1,492.5). The average working day lost was 1.2 working days, with an average of 1.3 days for the caregivers during the reporting period. The results suggest that medication and diagnostic testing were the largest cost drivers, and transportation and productivity losses were secondary drivers of cost of further diabetes treatment and follow-up.

Table 2. Direct Medical, Direct Non-Medical, and Indirect Costs Among Patients with Type 2 Diabetes Mellitus During the Past 3–4 Months (N = 385)

Cost Category	Cost Component	Mean	SD	Median
Direct Medical Costs	Physician consultations	4,211	2,322	3,900
	Medicines/testing supplies	24,699	11,093	22,100
	Laboratory tests	10,052	4,995	8,900
	Hospital charges	850	1,439	0
	Total direct medical costs	39,813	15,053	38,600
Direct Non-Medical Costs	Transportation	5,145	2,096	4,800
	Special food/supplements	1,941	1,495	2,100
	Paid attendant/caregiver	497	728	0
	Total direct non-medical costs	7,583	2,903	7,100
Indirect Costs	Patient workdays missed	1.2	1.8	0
	Patient income loss	1,863.9	2,902.1	0
	Caregiver workdays missed	1.3	1.2	1
	Caregiver income loss	1,492.5	1,427.0	1,300
	Total indirect costs	3,356.4	3,198.6	2,600
Overall Financial Burden	Total expenditure	50,752.4	—	—

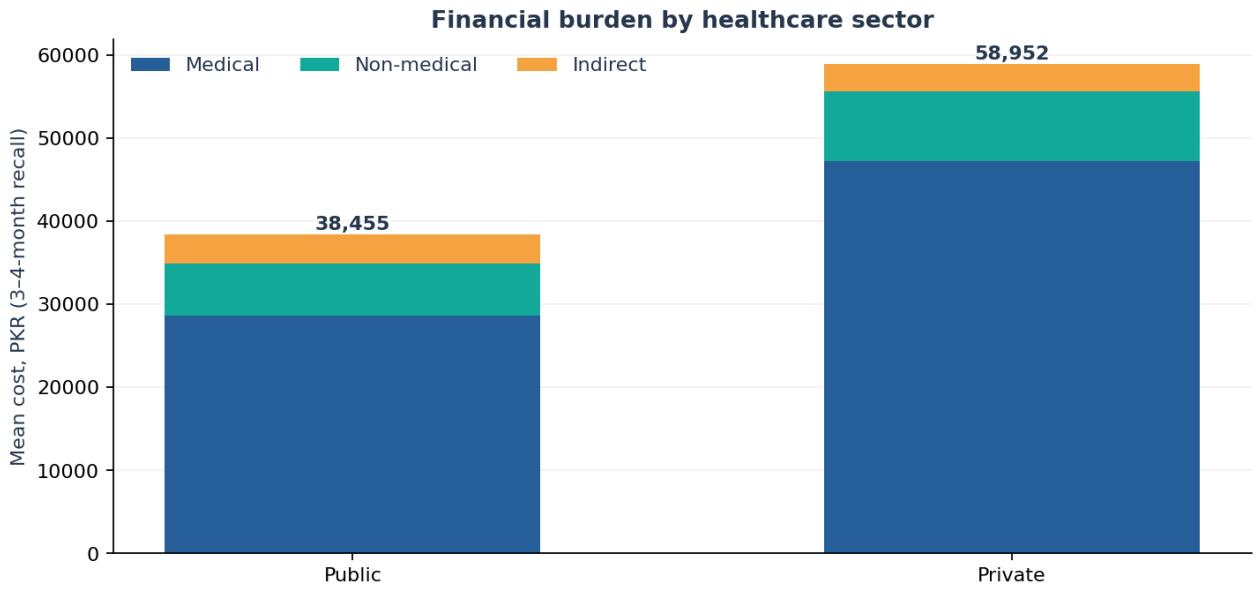

Figure 1. Mean costs by sector

The stacked columns show higher mean expenditure in private hospitals (PKR 58,952) than in the public hospital (PKR 38,455). Direct medical expenditure formed the largest segment of total cost in both sectors.

Table 3 shows the association between the financial burden and the hospital sector of 385 patients with type 2 diabetes mellitus. Of 154 participants who attended the public hospital, 110 (71.4%) had lower financial burden, and 44 (28.6%) had higher financial burden. In a total of 231 persons who attended private hospitals, 120 (51.9%) reported decreased financial burden, while 111 (48.1%) reported increased financial burden. Overall, 230 (59.7%) participants experienced lower financial burden, while 155 (40.3%) experienced higher financial burden. Financial burden had a statistically significant association with hospital sector ($\chi^2 = 13.78$, $p < 0.001$) as shown by Pearson's chi-square test. Patients attending the private hospital had a higher proportion experiencing higher financial burden than patients attending the public hospital. The results show that the hospital sector was strongly related to the financial burden of the data set analyzed, but does not provide a causal link given the cross-sectional nature of the comparison.

Table 3. Association Between Hospital Sector and Financial Burden Among Patients With Type 2 Diabetes Mellitus

Hospital sector	Lower financial burden n (%)	Higher financial burden n (%)	Total n (%)	χ^2	p-value
Public hospital	110 (71.4)	44 (28.6)	154 (40.0)		
Private hospitals	120 (51.9)	111 (48.1)	231 (60.0)		
Total	230 (59.7)	155 (40.3)	385 (100.0)	13.78	<0.001

Discussion

This present study focused on the financial strain associated with medication and post-hospitalization treatment of 385 type 2 diabetes mellitus (T2DM) patients attending both public and private hospitals in Swat district. The results indicated that 51.7% of the respondents were male, 48.3% were female, and the mean age was 51.9 ± 11.2 years. The marital status of the participants was 74.5% married, and 54.0% were rural. Differences in the socioeconomic backgrounds of participants were observed based on the mean monthly household income which was PKR 68,379. In the study conducted in Pakistan, it was found that 64.0% of the diabetic population were in the age group 41-60 years, and 54.0% were females. Their findings contrasted to the present study which showed a slight male predominance and smaller proportion of married participants. Based on the findings of Butt et al., household income and employment status are pertinent factors to consider when measuring treatment expenditure, as there were differences in financial burden for diabetes across various demographic and socioeconomic groups [13].

The current study showed that the medication cost was the highest direct medical cost in type 2 diabetic patients. During the previous three to four months, the mean direct medical expenses were PKR 39,813 ± 15,053 and medication and testing supplies amounted to PKR 24,699. Laboratory investigations amounted to PKR 10,052 and consultation cost was PKR 4,211 while hospital cost was PKR 850. Medications accounted for about 62.0% of total direct medical costs, signifying a significant contribution to the financial burden. In Pakistan, direct medical expenditure on diabetes was reported to be around 74% and the total annual medical expenditure due to diabetes was

reported as 69.4% of the total expenditure on diabetes. According to a nationwide study in Bangladesh, medicines accounted for around 75.43% of total OPEC of the diabetic patients. The proportion of costs spent on medicines that was lower in the present study might be due to differences in the methods of assessing expenditure, the healthcare environment, diagnostic expenses, and treatment regimen [13].

Assessment of direct non-medical expenditure showed that transportation cost and other health care related expenses were among the additional costs associated with diabetes. The mean direct non-medical expenditure was PKR 7,583 which was about 14.9 % of the total treatment related expenditure. The largest share was transportation (mean expenditure PKR 5,145) followed by nutritional supplements (mean expenditure PKR 1,941) and attendant expenses (mean expenditure PKR 497). The results indicated the cost burden of using health care facilities for routine visits and follow-up. Among the patients attending the health facilities for care or treatment of diabetes and hypertension, direct non-medical costs accounted for 11% of costs of treatment, reported by Naznin et al. in rural Bangladesh. They were a bit lower than the present finding which may be due to differences in accessibility of transportation, geographical location, and healthcare utilization. Arshad et al. found significant differences in the amount of expenditure for diabetes between countries in the Eastern Mediterranean region, highlighting the role of health systems and availability of diabetes treatment in expenditure burden [14].

In the present study, indirect financial costs of patients with diabetes receiving treatment were assessed for lost income and caregiver duties. During the reporting period, patients lost PKR 1,864 out of the direct expenditure and the caregiver lost PKR 1,493, which makes the indirect expenditure PKR 3,356. Average percentage of working days lost by participants was 1.2 days and that lost by caregivers, due to diabetes related care needs, was about 1.3 days. The indirect cost contribution was about 6,6%, smaller than that of direct medical expenditure, that is the actual costs of the disease. Arshad et al. reported that indirect cost of diabetes was 1.5% of total annual expenditure on diabetes among Pakistani patients, which was lesser than what was seen in the present study. Beyond the direct medical costs. Identified that 76% of diabetic individuals had suffered losses in productivity. By studying the lost productivity, unemployment, and informal caregiving, the indirect expenses of diabetes, Chen et al. concluded that diabetes poses significant economic burden, reinforcing the value of considering indirect costs when evaluating financial burden [15].

Financial coping mechanisms showed that the financial burden of diabetes had a significant impact on both the patients and their families. 79.0% of the participants paid for their treatment from regular household income, 46.5% borrowed money and 38.7% used their own personal savings. Almost one-quarter of participants (24.5%) received financial support from charitable or other sources, and 7.5% reported selling assets. 29.6% of respondents indicated moderate financial problem and 17.1% indicated severe financial problem in meeting essential household needs. The relationship between treatment affordability and diabetic treatment adherence was reported by Zafar et al., who found that 42% of the diabetic patients stated financial constraints as a major barrier to adherence to treatment. Financial problems, lack of adherence to treatment and poor glycemic control were reported. among Pakistani patients with diabetes, reiterating the significance of evaluating the economic burden of the household. In fact, it has been reported that there is a high burden of financial hardship for individuals who incur out-of-pocket health care expenses worldwide, which highlights the need for better financial protection and the cost of chronic disease management [16].

In the present study, it was found that the total financial cost of diabetes care was related to diabetes medications, laboratory tests, physician visits, transportation costs and lost income. The mean total expenditure was PKR 50,753 in the previous three to four months, of which about 78.4% was on direct medical expenses. Medications for the mouth only were prescribed to 56.4% of the participants, 24.7% were prescribed combination therapy, and 15.8% were prescribed insulin alone. Thirty-nine.2% reported diabetes-related complications, and the mean length of diabetes was 7.6 years. To determined factors related to higher treatment expenditure for Pakistani diabetic patients including longer duration of disease, multiple complications, and combination drug therapy. Ahmad et al. found that 26.6 % of the people who attended Saidu Group of Teaching Hospital, Swat faced some level of non-adherence with financial problem being an important barrier to adherence. The results confirmed the importance of exploring financial issues associated with treatment in Swat, but there was no causal relationship between expenditure and medication adherence found in this analysis [17].

CONCLUSION

In the study, 385 type 2 diabetes mellitus patients who were admitted in public and private hospitals of District Swat were subjected to financial burden of medication and follow-up treatment. The fictional data indicated that the average total expenditure in the previous 3-4 months was PKR

50,753, with the biggest share of total expenditure being the cost of medication and diagnostic investigations. The mean expenditure (PKR 58,952) of patients attending private hospitals was higher than that for public hospital (PKR 38,455) but the difference was statistically significant ($p < 0.001$). Patients' dependence on household income, saving, borrowing and financial help were indicators of financial difficulties. The study found that financial protection, low cost medicines and readily available diagnostic services are key factors to alleviate the economic burden of diabetes care in District Swat.

RECOMMENDATIONS OF THE STUDY

1. Affordable medications: Ensure the availability of essential antidiabetic medicines and insulin at subsidized prices in public hospitals.
2. Financial assistance: Strengthen government and hospital-based financial support programs for low-income diabetic patients.
3. Accessible follow-up care: Improve the availability of affordable consultations and routine diabetes monitoring services.
4. Reduced diagnostic costs: Provide essential laboratory investigations at subsidized rates for economically disadvantaged patients.
5. Patient education: Nurses and healthcare professionals should educate patients about medication adherence, diabetes management, and regular follow-up care.

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