Texila International Journal of Public Health
ISSN: 2520-3134
DOI: 10.21522/TIJPH.2013.10.04.Art028

Impact of the Covid-19 Pandemic on Care of Patients with Diabetes Mellitus at Kitwe Teaching Hospital in 2021

Webster Chewe[1,2*], Abidan Chansa[2], James Zulu[3]
[1]*Department of Public Health, Texila American University, Lusaka, Zambia*
[2]*Department of Internal Medicine, Kitwe Teaching Hospital, Kitwe, Zambia*
[3]*District Health Director, Kafue District, Kafue, Zambia*

Abstract

Coronavirus disease 2019 (Covid-19) pandemic tested the resilience of the health care system in many countries including Zambia. At the peak, disruption of the global supply chain affected availability of essential commodities needed to manage many health ailments like diabetes mellitus (DM). The study was aimed to understand the challenges faced by DM patients in accessing specialist services at KTH DM specialist clinic during the Covid-19 pandemic in 2021. A cross sectional descriptive study was conducted with a total of 293 participants (109 males and 184 females) recruited using a designed structured questionnaire and results analyzed using Microsoft Office Excel 2016 and the Statistical Package for Social Sciences (SPSS) version 16.0 software. The mean age was 54.0 ± 13.0 years old with 78(26.6%) being below the age of 45 years. 197(67.2%) were married and 157(53.6%) had primary education or less. 216(73.7%) and 222(75.8%) were earning <US$5.00 per day before and during Covid-19 pandemic respectively while the majority were spending one fifth of their earned income on medication from private pharmacies alone. 231(78.8%) had T2DM while 149(50.8%) had high plasma glucose levels; high BMI, high waist circumference and hypertension 184(62.8%). The study suggested that disruption of outpatient services led to patients presenting with high plasma glucose levels, poorly controlled weight (high BMI and high waist circumference). Commonest complications included hypertension and peripheral neuropathy. There is a need to devise a more pragmatic and resilient healthcare system in future to minimize the effects of any pandemic should they arise.

Keywords: *Covid-19, Diabetes medication, Diabetes mellitus, Essential healthcare services, Hypertension, Lifestyle modification.*

Introduction

Diabetes mellitus (DM) is a chronic condition affecting over 463 million people in 2019 and is estimated to rise to 578 million by 2030 corresponding to global prevalence of 9.3 percent and 10.2 percent respectively [1, 2]. The rise in the prevalence is attributed to the growing population and modernization which has brought about increased access and consumption of more processed foods coupled with increased sedentary lifestyles as people become more affluent. Although there has been an increase in non-communicable diseases (NCDs) like cancers, obesity, DM, hypertension (HTN) etc., improved access to healthcare services in many countries is helping people live much longer [3-5].

Oftentimes, DM maybe undiagnosed for a long time until someone presents to a health facility after an episode of a stressful event like major surgery, stroke, and infections [urinary tract infection, common cold, coronavirus disease 2019 (Covid-19), etc] [6-8]. This makes

Received: 09.11.2022 ***Accepted: 16.11.2022*** ***Published on: 29.12.2022***
****Corresponding Author: webrychew@gmail.com***

it difficult to know the exact number of people affected by DM [5].

The prevalence of DM in Zambia as of 2016 was estimated to be around 3.5 percent translating to 3500 per 100,000 people [1, 9-10]. This high prevalence is significant for a lower middle-income country like Zambia with a gross domestic product (GDP) of 23.31 billion United States Dollars (USD) in 2019 [11] coupled with poor healthcare system. The resource allocation to the health sector was constrained in the recent past due to competing priorities like offsetting of the high external debt and the ravaging effects of Covid-19. According to the Africa Development Bank (AfDB) report of 2021, Zambia's economy fell into a deep recession due to the adverse impact of Covid–19 while the real GDP contracted by an estimated 4.9 percent in 2020, despite recording annual growth of 4.0 percent in 2018 and 1.9 percent in 2019 [12]. This contraction led to an unprecedented deterioration in all the key sectors of the economy. Further, the national health budget decreased from 9.5 percent in 2018 to 9.3 percent in 2019 from a total national budget of 71.66 billion and K86. 8 billion in 2018 and 2019 respectively [13].

To add to the economic whorls alluded earlier, the inflation rate rose from 9.8% in 2019 to 16.35% in 2020 causing the prices of all essential commodities to skyrocket beyond the reach of many average Zambians where in some instances, prices doubled in the last three years [10]. The rise in prices also affected the cost of DM medicines like insulin and oral hypoglycemic.

The effects of Covid-19 pandemic cannot be overstated as it disrupted the global supply chain of all imported commodities while testing the resilience of the health care systems during peak days of the pandemic [14-18] while import dependent countries like Zambia were worst affected [19-21].

Kitwe teaching hospital (KTH), a third level hospital on the Copperbelt province of Zambia is a government tertiary hospital offering specialized care for most NCDs including DM.

As such, the study was aimed to understand the challenges faced by DM patients in accessing specialist services at KTH DM specialist clinic during the Covid-19 pandemic in 2021 as no known study has been conducted in the study area.

Further, the findings of this study will be used to strengthen policy and make the healthcare system more resilient and used as a base for future scientific research.

Materials and Methods

A descriptive cross-sectional study conducted at KTH DM specialist clinic in Kitwe district, Copperbelt Province, Zambia in 2021.

Sampling and Sample Size

The study target population were recruited using convenient sampling at KTH DM specialist clinic over a two-month period using a standardized questionnaire. The participants were from among patients who came for the regular specialist DM outpatient clinic reviews. The information was collected face to face following the Covid-19 prevention guidelines.

The sample size was estimated using the Cochran formula as outlined below:

$$N = \frac{(z^2 pq)}{e^2}$$

Where:

N = Sample size.

P = 0.5.

q = 1 – P.

Confidence level = 95%.

Z = Z-score = 1.96.

e = Confidence interval (margin of error) = ± 5%.

Thus:

$$N = \frac{[(1.96)^2(0.5)(1-0.5)}{(0.05)^2} = 385$$

Therefore, the sample size was 385 participants.

Inclusion and Exclusion Criteria

The study included participants who:

1. Were 16 years of age and above.
2. Had confirmed DM disease following the international diabetes federation (IDF) diagnostic criteria [1].

We excluded:

1. Uncooperative participants.
2. Participants with incomplete parameters.

Data Collection

The research assistants collected the information using a structured pretested questionnaire which was allocated a unique identification number. The information that were collected was in three sections as follows:

Section A which focused on demographic information which included age, sex, marital status, education level, current employment status and if employed, in which sector and nature of the job, an estimated monthly income before and during the Covid-19 pandemic and residence of the participant. Also, information on smoking and alcohol intake.

Section B focused on clinical parameters. The information was collected from both the participant and participants' hospital file. The information included the type of DM, current blood sugar levels at the time of interview as recorded in the file, how long they have had DM, frequent symptoms experienced, any comorbidities or complications, whether participant was admitted in the hospital in the previous 12 months, and if so, how many times what the stated reason for the last admission was and how long the longest hospital stay was. The other information included anthropometric measurements which included height, weight, and waist circumference. Also, DM medication the participant was currently taking, levels of glycated hemoglobin (HbA1c) and lipid profile which includes cholesterol, triglycerides (TG), high-density lipoprotein (HDL) and low-density lipoprotein (LDL), date when current HbA1c and lipid profile were done and reason why HbA1c or lipid profile was not done if not present in the file.

Section C included information on how the participants were accessing DM medicines before and during the pandemic, how much in monetary form they spent on both DM and Non-DM medications before and during Covid-19 pandemic. Also, how DM has impacted on their life and how the Covid-19 pandemic has affected their medicine supply and what they think should change about the medicine supply. The other information collected were participants' knowledge on symptoms of hypoglycemia.

Data Analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0 for windows (SPSS Inc, Chicago, IL, USA). Basic descriptive statistics using frequency, percentages, the mean and standard deviation were done. Further, descriptions, tables and graphs were used to summarize the analyzed data presentations using Microsoft Excel 2016.

Ethical Clearance and Confidentiality

Ethical clearance was obtained from Tropical Diseases Research Centre Ethics Review Committee (TDRC-ERC), I.R.B. No. 00002911, F.W.A. No. 00003729 under reference number: TRC/C4/11/2021 and National Health Research Authority (NHRA) under reference number: NHRA0000001/20/11/2021. Confidentiality was maintained to the participants as no names were used. Identifiers in the form of codes and numbers were used by the research team. The information obtained was stored in an encrypted file with a password and only available to the research team and the research supervisors.

Results

The study enrolled 293 participants. Table 1 below illustrates the participant's demographics. The mean age was 54.0 years with a standard deviation (SD) of 13.0 years (54.0 ± 13.0 years old) and the majority were females 184(62.8%). The comparative mean age between males and females was 52.7 ± 13.2 and 53.7 ± 12.8 years

respectively. Further, the study showed that 78(26.6%) of the participants were below the age of 45 years.

The participants who were married were 81(74.3%) of the males and 116(63.0%) of the females while majority of the male participants 59(54.1%) had attained secondary education whereas 107(58.2%) of the female participants had only attained primary education or less. The study further showed that 58(53.2%) of the males were in the informal sector compared with 81(44.0%) of the female counterparts. The participants indicated that the informal sector was mainly business related. The participants who were retired were 19(17.4%) of the males and 17(9.2%) of the females. The unemployed participants were 29(26.6%) of the males and 83(45.1%) of the females.

Furthermore, the study showed that 72(66.1%) of the male participants earned less than US$140.00 per month before Covid-19 pandemic with the number slightly increasing to 78(71.6%) during the Covid-19 pandemic. On the other hand, 114(62.0%) of the female participants earned less than US$140.00 per month before Covid-19 pandemic with the number increasing to 144(78.3%) during the Covid-19 pandemic. This is further illustrated in figure 1. The differences in the estimated monthly household income before and during Covid-19 pandemic. The study further showed that 4(3.7%) of the male participants and 14(7.6%) of the female participants were smokers while 27(24.8%) of the male participants and 18(9.8%) of the female participants admitted to partaking alcohol.

Table 1. Socio-demographic Features of the Participants

Characteristic		**Male**	**Female**
		(n=109; 37.2%)	**(n=184; 62.8%)**
Mean age–years (±SD) (54.0 ± 13.0		52.7 ± 13.2	53.7 ± 12.8
Age groups in years n (%)	16 – 35	14 (12.8)	2 (12.0)
	36 – 55	43 (39.4)	77 (41.8)
	56 – 75	51 (46.8)	83 (45.1)
	>75	1 (0.9)	2 (1.1)
Pregnant – yes		n/a	9 (4.9)
Marital status n (%)	Single	9 (8.3)	8 (4.3)
	Married	81 (74.3)	116 (63.0)
	Widow	6 (5.5)	44 (23.9)
	Divorced	8 (7.3)	10 (5.4)
	Separation	5 (4.6)	6 (3.3)
Education level n (%)	Primary or less	50 (45.9)	107 (58.2)
	Secondary	45 (41.3)	63 (34.2)
	Tertiary	14 (12.8)	14 (7.6)
Occupational status n (%)	Formal	3 (2.6)	3 (1.6)
	Informal	58 (53.2)	81 (44.0)
	Retired	19 (17.4)	17 (9.2)
	Unemployed	29 (26.6)	83 (45.1)
Estimated monthly household income before Covid-19 pandemic (US$) * n (%)	<140.00	72 (66.1)	114 (62.0)
	140.00 – 277.99	25 (22.9)	18 (9.8)
	278.00 – 416.00	8 (7.3)	2 (1.1)
	>416.00	4 (3.7)	20 (10.9)
	<140.00	78 (71.6)	144 (78.3)

Estimated monthly household income during Covid-19 pandemic (US$) * n (%)	140.00 – 277.99	21 (19.3)	20 (10.9)
	278.00 – 416.00	4 (3.7)	4 (2.2)
	>416.00	6 (5.5)	16 (8.7)
History of smoking – yes n (%)		4 (3.7)	14 (7.6)
History of taking alcohol – yes n (%)		27 (24.8)	18 (9.8)

*US$1=ZMW18.00, Covid-19: Coronavirus disease 2019; SD: standard deviation; US$: United States Dollars; ZMW: Zambian Kwacha

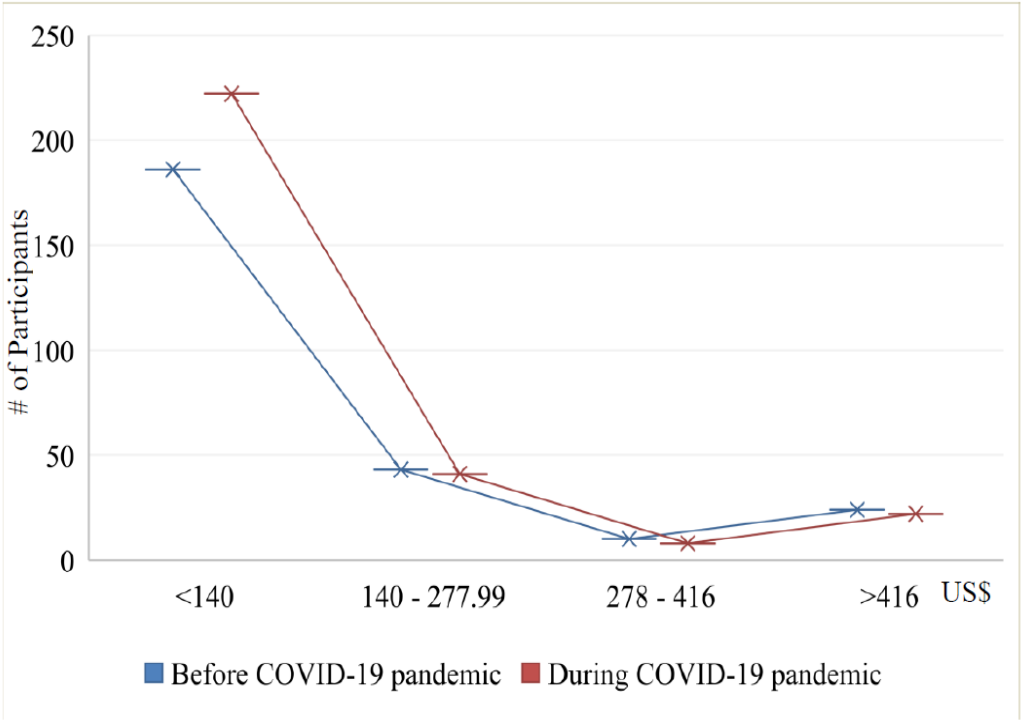


Figure 1. Estimated Monthly Income before and during Covid-19 Pandemic among the Participants

The clinical features of the participants shown in table 2 revealed that 53(18.1%) had T1DM and 231(78.8%) had T2DM with 9(3.1%) having gestational DM. Most of the participants [57(52.3%) of the males and 92(50.0%) of the females] had a random plasma glucose of more than 11.1 mmol/L at the time of clinical review during the study.

Most of the male 56(51.4%) and female 102(55.4%) participants had DM for more than 60 months with 14(12.8%) of the males and 28(15.2%) of the females having DM for less than 13 months. The study further showed that 50(45.9%) of the male participants and 96(52.3%) of the female participants had a systolic blood pressure of more than or equal to 140mmHg whereas 26(23.8%) of the males and 57(31.0%) of the female participants had diastolic blood pressure of more than or equal to 90 mmHg.

The male participants with body mass index (BMI) in the overweight range (BMI between 25.0 and 29.9 kg/m^2) was 41(37.6%) and for the female participants was 71(38.6%). The participants in obese range (BMI more than or equal to 30.0 kg/m^2) where 18(16.5%) of the male participants and 66(39.6%) of the female participants. The waist circumference distribution among participants showed that 18(16.5%) of male participants had waist circumference more than 102 cm and

142(77.2%) of the female participants had waist circumference more than 88 cm.

The participants indicated that 55(50.5%) of the male participants and 115(63%) of the female participants had osmotic symptoms at the time of the study. Furthermore, the study showed that 76(69.7%) of the male participants and 142(77.2%) of the female participants had at least one complication of DM. The complications were further disaggregated with the majority having HTN [64(58.7%) of male participants and 120(65.2%) of female participants], followed by peripheral neuropathy [38(34.9%) of the male participants and 83(45.1%) of the female participants].

There were 37(33.9%) of male participants and 54(29.3%) of the female participants admitted to the hospital in the preceding 12 months for various reasons ranging from high plasma glucose, high blood pressure and diabetic foot. The study also showed that 33(30.3%) of the males and 46(25.0%) of the female participants were on insulin alone. The participants who were on oral hypoglycemic medication alone were 70(64.2%) of the male participants and 116(63.0%) of the female participants. The oral hypoglycemic medications included glibenclamide, gliclazide and metformin with the rest of the participants being on both insulin and oral hypoglycemics.

The study further showed that 99(90.8%) of the male participants and 158(85.9%) were practicing at least one lifestyle modification as part of the overall management of DM. The lifestyle modifications included low calorie intake, weight reduction and regular exercise. Only 2(0.8%) of the patients were following all the three lifestyle modifications assessed.

The study revealed that insulin acceptability in future for those not on insulin was 25(22.9%) of the male participants and 43(23.4%) of the female participants responded favorably to accepting insulin in the near future should they transition to insulin. Those who responded not in favor of insulin initiation cited reasons like fear of needles, pain associated with injection, insulin is expensive, insulin drops plasma glucose faster, etc.

On the aspect of drug accessibility, it was noted that 99(90.8%) of male participants and 170(92.4%) were accessing medication from both public and private pharmacies. The majority of the participants [92(84.4%) of the males and 142(77.1%) of the females] indicated that they spent not more than US$20.00 per month on medication for diabetes and its associated conditions. This is further illustrated in figure 2.

The participants' knowledge on hypoglycemia symptoms indicated that 91(83.5%) of males and 140(76.1%) had experienced some symptoms of hypoglycemia.

Table 2. Clinical Parameters of Participants

Characteristic		**Male**	**Female**
		(n=109; 37.2%)	**(n=184; 62.8%)**
Type of DM n (%)	TIDM	29 (26.6)	24 (13.0)
	T2DM	80 (73.4)	151 (82.1)
	Gestational DM	n/a	9 (4.9)
Random Plasma glucose (mmol/L) n (%)	7.9 – 11.1	32 (29.4)	42 (22.8)
	>11.1	57 (52.3)	92 (50.0)
Duration of DM (months) n (%)	≤12	14 (12.8)	28 (15.2)
	13 – 36	25 (22.9)	32 (17.4)
	37 – 60	14 (12.8)	22 (12.0)
	61 – 84	21 (19.3)	10 (5.4)

	>84	35 (32.1)	92 (50.0)
Systolic BP (mmHg) n (%)	120 – 139	35 (32.1)	52 (28.3)
	140 – 159	34 (31.2)	58 (31.5)
	≥160	16 (14.7)	38 (20.7)
Diastolic BP (mmHg) n (%)	80 – 89	39 (35.8)	63 (34.2)
	90 – 99	14 (12.8)	43 (23.4)
	≥100	12 (11.0)	14 (7.6)
BMI (kg/m^2) * n (%)	25.0 – 29.9	41 (37.6)	71 (38.6)
	30.0 – 34.9	16 (14.7)	36 (19.6)
	35.0 – 39.9	2 (1.8)	22 (12.0)
	≥40.0	0 (0.0)	8 (4.3)
Waist circumference (cm) n (%)	>88	-	142 (77.2)
	>102	18 (16.5)	-
Osmotic symptoms[†] – yes n (%)		55 (50.5)	115 (63.0)
Comorbidities/DM complications[**] – yes n (%)		76 (69.7)	142 (77.2)
Comorbidities/DM complications n (%)	HTN	64 (58.7)	120 (65.2)
	Peripheral neuropathy	38 (34.9)	83 (45.1)
	Diabetic retinopathy	6 (5.5)	13 (7.1)
	Diabetic foot	8 (7.3)	4 (2.2)
	Stroke	4 (3.7)	8 (4.3)
Hospital admission in the last 12 months – yes n (%)		37 (33.9)	54 (29.3)
Reason for last admission to the hospital in the previous 12 months n (%)	High Plasma glucose	29 (26.6)	32 (17.4)
	High BP	8 (7.3)	8 (4.3)
	Diabetic Foot	4 (3.7)	8 (4.3)
Medications n (%)	Insulin only	33 (30.3)	46 (25.0)
	Oral Hypoglycemics only	70 (64.2)	116 (63.0)
	Both Insulin and Oral Hypoglycemics	6 (5.5)	22 (12.0)
Commonly used oral hypoglycemics n (%)	Metformin only	15 (13.8)	26 (14.1)
	Glibenclamide only	4 (3.7)	16 (8.7)
	Metformin and Glibenclamide	57 (52.3)	92 (50.0)
Lifestyle modification[§] – yes n (%)		99 (90.8)	158 (85.9)
Insulin acceptance in future[‡] – yes		25 (22.9)	43 (23.4)
Diabetic medication accessibility n (%)	Public Pharmacy only	6 (5.5)	14 (7.6)
	Private Pharmacy only	4 (3.7)	0 (0.0)
	Both Public and Private Pharmacy	99 (90.8)	170 (92.4)
Money spent on Medication for diabetes and its associated	<10.00	47 (43.1)	88 (47.8)
	10.00 – 19.99	45 (41.3)	54 (29.3)
	20.00 – 29.99	6 (5.5)	22 (12.0)
	30.00 – 39.99	10 (9.2)	6 (3.3)

conditions per month (US$) [Ψ] n (%)	40.00 – 49.99	0 (0.0)	2 (1.1)
	≥50.00	2 (1.8)	8 (4.3)
	Not Indicated	6 (5.5)	12 (6.5)
Knowledge on hypoglycemia – yes n (%)		91 (83.5)	140 (76.1)

[*]The body-mass index is the weight in kilograms divided by the square of the height in meters.

[†] Includes one or more of the following symptoms: polydipsia, polyuria, and polyphagia

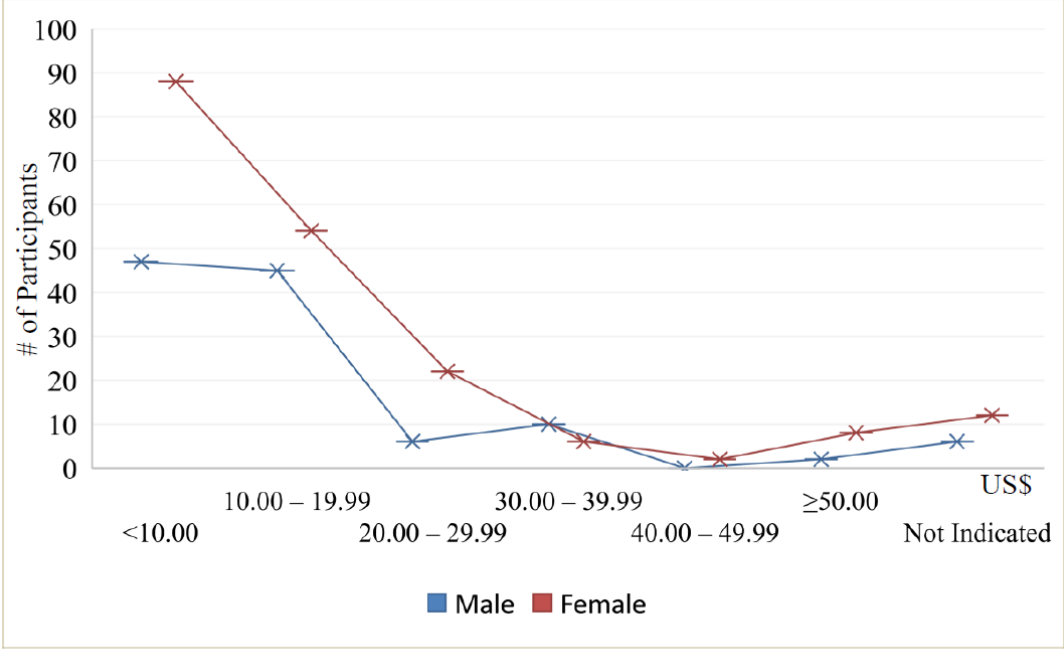
[**]Comorbidities included diabetic foot, diabetic retinopathy, erectile dysfunction, hypertension, malignancy, peripheral neuropathy, and Stroke. Only the most common comorbidity options are shown in the table.

[§] includes regular exercise, low calorie intake and weight management.

[‡] For participants who were on oral hypoglycemic only.

[Ψ] US$1=ZMW18.00.

BMI: Body Mass Index; BP: blood pressure; cm: centimeters; DM: Diabetes Mellitus; HTN: Hypertension; kg: kilogram; m: meters; T1DM: Type 1 diabetes mellitus; T2DM: Type 2 diabetes mellitus; US$: United States Dollars; ZMW: Zambian Kwacha.



US$: United States Dollars

Figure 2. Money Spent on Medication for Diabetes and its Associated Conditions per Month by Participants

Clinical monitoring of DM patients requires laboratory tests to be performed. As such, the study showed that 42(14.3%) of all the participants had HbA1c results on their file at the time of clinical review with a mean HbA1c of 9.36 ± 2.13%. The participants who did not have results on the file said that clinicians did not request [180(71.7%)]; participants did not have the money to pay for the test [41(16.3%)]; participant forgot to do the test [22(8.8%)] and 8(3.2%) gave other reasons not stated above.

The response was similar for lipid profile laboratory results. Only 34(11.6%) had lipid profile results on the file. Similarly, the reason for not having lipid profile results included: clinicians' failure to request [184(69.4%)]; participants did not have the money to pay for the test [47(17.7%)]; participants forgot despite

being requested to do the test [24(9.1%)] and other reasons not stated above [10(3.8%)].

Discussion

This study revealed the challenges DM patients faced in accessing DM specialized medical services during the Covid-19 pandemic which began in late 2019 [22, 23]. The study showed that most of the patients presented with poorly controlled blood sugar levels with a high BMI and waist circumference. Studies have shown that DM being a chronic condition is associated with severe consequences in patients who are obese and have persistently elevated blood glucose levels [24-29]. The above observations are usually in patients who default treatment and those who have not optimally controlled the blood sugar levels which the Covid-19 pandemic may have contributed due to the disruption of essential healthcare services 21-30]. At KTH, some patients were given longer than normal outpatient review dates.

The study also showed that the most common type of DM among our patients was T2DM with most of the patients being above the age of 45 years like epidemiological studies conducted worldwide [1, 31, 32]. Most of the patients were married which may indicate a good social support system as studies conducted by the Australian Diabetes MILES-2 cross-sectional online survey showed that social support was associated with more optimal self-care in patients with diabetes [33-35]. However, our study showed that most of the patients [149(50.9%)] had poor glycemic control.

The study revealed that the majority of the patients had only attained primary education or less [157(53.6%)] as studies have shown that patients with low education levels may limit the knowledge about the disease leading to non-adherence to prescribed medication [36, 37] while other studies have shown that the development of DM does not depend on the education level as DM affect people of all socioeconomic levels [37, 38].

Further, occupational status may be tied to the income levels on an individual as this study had shown that majority of the patients were in informal employment with several patients living on approximately US$5.00 per day (US$140.00 per month) and spending at least US$1.00 per day (US$20.00 per month) on medication for DM and its associated conditions in private pharmacies. Studies conducted in Zambia have shown that antidiabetic and antihypertensive medicines were inadequately available coupled with prices that are higher than their international reference prices and that treatment with these medicines was largely unaffordable against the set affordability thresholds [39, 40].

The study showed that patients who had DM for more than 60 months were also at increased risk of having poor glycemic control (50.9%) and at least one complication of DM (74.4%) with studies conducted agreeing to what has been observed [41]. Extensive studies have shown that persistent hyperglycemia damages the capillary endothelial cells in the retina, mesangial cells in the renal glomeruli and schwan cells of peripheral nerves leading to the observed complications [24, 36, 41-43].

The study also showed that males were more likely to engage in at least one of the lifestyle modifications as part of overall management of DM than women. A study done by Perreault et al had shown that males are more likely to engage in physical activities than females [44]. The lifestyle modifications have been shown to be cost effective in the immediate term but the evidence of long-term maintenance of health benefits is still limited [45]. The study further showed that males were three times more likely to engage in social activities like alcohol drinking than females although mild to moderate alcohol intake has shown not to have any adverse effects on the control of blood glucose levels [46].

Study Limitations

The reduced sample size (293 participants recruited from the target of 385 participants) may cause biasness in the data and hence may not be used as a true overall picture for the whole country. Secondly, this was a cross-sectional study hence no inferences could be made regarding causality. Lastly, constraints in financial resources affected acquiring equipment like a stadiometer, glucometer and glucosticks and blood pressure machines and engaging more research assistants hence contributed to reduced sample size.

Conclusion

The DM services at KTH specialist clinic were disrupted during Covid-19 leading to most patients presenting with poorly controlled blood sugar levels, poorly controlled weight as attributed by a high BMI and high waist circumference. The majority of the patients have T2DM, were married and spent one fifth (1/5th) of their earned income in private pharmacies on medication for DM and their associated conditions.

Commonest complications included hypertension and peripheral neuropathy. There is a need to devise a more pragmatic and resilient healthcare system in future to minimize the effects of any pandemic should they arise.

Recommendations

1. Prospective multicenter study to ascertain the long-term impact/complications of Covid-19 pandemic on DM patients.
2. Nutritional policy: Strengthen the local nutritional policy for DM patients and incorporated into their daily management of DM.
3. Eye screening: The annual eye screening needs to be strengthened to all DM patients as they come for their clinic review. There is also a need for close collaboration with eye hospitals across the country.
4. Laboratory support: Strengthen the local laboratories to undertake tests like HbA1c and comprehensive lipid profile for optimal management of DM patients.
5. DM medicine: Supply of medication for DM and its associated conditions is a major challenge for most DM patients hence the need to strengthen the overall drug supply chain.
6. Social cash transfer: DM patients who do not have any form of income should be considered for social cash by the government to help alleviate the socio-economic distress experienced by DM patients.
7. Smart technologies: Adopt smart technologies like teleconferencing and co-opt them in the overall management of chronic conditions like DM.

Conflict of Interest

The study was funded using personal resources hence declared no conflict of interest with any person or organization.

Acknowledgements

Our gratitude goes to the management of Kitwe teaching hospital for their permission to conduct this research.

References

[1] R. (chair) et al. Williams, IDF Diabetes Atlas 9th. 2019.

[2] American Diabetes Association, “Standards of Medical Care in Diabetes—2022 Abridged for Primary Care Providers,” Clin. Diabetes, vol. 40, no. 1, pp. 10–38, Jan. 2022, doi: 10.2337/cd22-as01.

[3] A. Ramachandran, C. Snehalatha, E. Latha, M. Manoharan, and V. Vijay, “Impacts of urbanisation on the lifestyle and on the prevalence of diabetes in native Asian Indian population,” Diabetes Res. Clin. Pract., vol. 44, no. 3, pp. 207–213, Jun. 1999, doi: 10.1016/S0168-8227(99)00024-8.

[4] T. I. A. SØrensen, “The changing lifestyle in the world: Body weight and what else?” in Diabetes Care, 2000, vol. 23, no. SUPPL. 2.
[5] N. G. Forouhi and N. J. Wareham, “Epidemiology of diabetes,” Medicine (Baltimore)., vol. 38, no. 11, pp. 602–606, Nov. 2010, doi: 10.1016/j.mpmed.2010.08.007.
[6] S. Mallapaty, “Evidence suggests the coronavirus might trigger diabetes,” Nature, pp. 16–17, 2020.
[7] S. Peric and T. M. Stulnig, “Diabetes and Covid-19,” Wien. Klin. Wochenschr., vol. 132, no. 13–14, pp. 356–361, Jul. 2020, doi: 10.1007/s00508-020-01672-3.
[8] L. Marchand, M. Pecquet, and C. Luyton, “Type 1 diabetes onset triggered by Covid-19,” Acta Diabetol., vol. 57, no. 10, pp. 1265–1266, Oct. 2020, doi: 10.1007/s00592-020-01570-0.
[9] S. Lou Bailey et al., “Diabetes mellitus in Zambia and the Western Cape province of South Africa: Prevalence, risk factors, diagnosis and management,” Diabetes Res. Clin. Pract., vol. 118, pp. 1–11, 2016, doi: 10.1016/j.diabres.2016.05.001.
[10] Zambia Statistical Agency, “The Zambia Statistical Agency (ZamStats).” https://www.zamstats.gov.zm (accessed May 20, 2021).
[11] IMF, World Economic Outlook: Recovery During a Pandemic, no. May. 2021.
[12] African Development Bank (AfDB) Group, “Zambia Economic Outlook,” 2021. https://www.afdb.org/en/countries-southern-africa-zambia/zambia-economic-outlook (accessed May 20, 2021).
[13] Zambia Ministry of Finance, “Annual Economic Report - 2019,” Lusaka, 2020. [Online]. Available: https://www.mof.gov.zm/?wpfb_dl=264.
A. Sharma, P. Gupta, and R. Jha, “Covid-19: Impact on Health Supply Chain and Lessons to Be Learnt,” J. Health Manag., vol. 22, no. 2, pp. 248–261, Jun. 2020, doi: 10.1177/0972063420935653.
[14] V. Haldane et al., “Health systems resilience in managing the Covid-19 pandemic: lessons from 28 countries,” Nat. Med., vol. 27, no. 6, pp. 964–980, Jun. 2021, doi: 10.1038/s41591-021-01381-y.
[15] A. Sagan et al., “Covid-19 and Health Systems Resilience: Lessons Going Forward,” Eurohealth (Lond)., vol. 26, no. 2, pp. 20–24, 2020, [Online]. Available: https://apps.who.int/iris/bitstream/handle/10665/336290/Eurohealth.
[16] A. Desta et al., “Impacts of Covid-19 on essential health services in Tigray, Northern Ethiopia: A pre-post study,” PLoS One, vol. 16, no. 8, p. e0256330, Aug. 2021, doi: 10.1371/journal.pone.0256330.
[17] M. Zakoji and T. Sundararaman, “Emerging good practices and lessons learnt to maintain essential health services during the Covid-19 pandemic,” WHO South-East Asia J. Public Heal., vol. 10, no. 3, p. 26, 2021, doi: 10.4103/2224-3151.309868.
[18] Z. Aranda et al., “Disruptions in maternal health service use during the Covid-19 pandemic in 2020: Experiences from 37 health facilities in low-income and middle-income countries,” BMJ Glob. Heal., vol. 7, no. 1, pp. 1–10, 2022, doi: 10.1136/bmjgh-2021-007247.
[19] K. Blanchet et al., “Protecting essential health services in low-income and middle-income countries and humanitarian settings while responding to the Covid-19 pandemic,” BMJ Glob. Heal., vol. 5, no. 10, pp. 1–9, 2020, doi: 10.1136/bmjgh-2020-003675.
[20] World Health Organization, “Covid-19 continues to disrupt essential health services in 90% of countries,” 2021. https://www.who.int/news/item/23-04-2021-covid-19-continues-to-disrupt-essential-health-services-in-90-of-countries (accessed May 20, 2021).
[21] World Health Organization, “Nearly 1 in 5 Covid-19 deaths in the African region linked to diabetes,” 2020. https://www.afro.who.int/news/nearly-1-5-covid-19-deaths-african-region-linked-diabetes (accessed May 20, 2021).
[22] A. Huang et al., “Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China,” Lancet, vol. 395, no. 10223, pp. 497–506, Feb. 2020, doi: 10.1016/S0140-6736(20)30183-5.
[23] A. Flyvbjerg, “Pathogenesis of Microvascular Complications,” in Textbook of Diabetes, Chichester, UK: John Wiley & Sons, Ltd, 2016, pp. 541–553.
[24] M. Khamaisi, G. L. King, K. Park, and Q. Li, “Pathogenesis of Microvascular Complications,” in Diabetes Complications, Comorbidities and Related

Disorders, 2nd ed., Springer, Cham, 2020, pp. 161–201.
[25] M. J. Fowler, “Microvascular and Macrovascular Complications of Diabetes,” Clin. Diabetes, vol. 26, no. 2, pp. 77–82, Apr. 2008, doi: 10.2337/diaclin.26.2.77.
[26] Diabetes Control and Complications Trial Research Group, “Effect of intensive diabetes treatment on the development and progression of long-term complications in adolescents with insulin-dependent diabetes mellitus: Diabetes Control and Complications Trial,” J. Pediatr., vol. 125, no. 2, pp. 177–188, Aug. 1994, doi: 10.1016/S0022-3476(94)70190-3.
[27] UK Prospective Diabetes Study (UKPDS) Group, “Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34),” Lancet, vol. 352, no. 9131, pp. 854–865, Sep. 1998, doi: 10.1016/S0140-6736(98)07037-8.
[28] Z. He and G. L. King, “Microvascular complications of diabetes,” Endocrinol. Metab. Clin. North Am., vol. 33, no. 1, pp. 215–238, Mar. 2004, doi: 10.1016/j.ecl.2003.12.003.
[29] G. Rayman et al., “Guidelines for the management of diabetes services and patients during the COVID-19 pandemic,” Diabet. Med., vol. 37, no. 7, pp. 1087–1089, Jul. 2020, doi: 10.1111/dme.14316.
[30] A. Kazi and L. Blonde, Classification of diabetes mellitus, vol. 21, no. 1. 2001.
[31] M. A. B. Khan, M. J. Hashim, J. K. King, R. D. Govender, H. Mustafa, and J. Al Kaabi, “Epidemiology of Type 2 Diabetes – Global Burden of Disease and Forecasted Trends,” J. Epidemiol. Glob. Health, vol. 10, no. 1, p. 107, 2019, doi: 10.2991/jegh.k.191028.001.
[32] H. A. van Dam, F. G. van der Horst, L. Knoops, R. M. Ryckman, H. F. J. M. Crebolder, and B. H. W. van den Borne, “Social support in diabetes: a systematic review of controlled intervention studies,” Patient Educ. Couns., vol. 59, no. 1, pp. 1–12, Oct. 2005, doi: 10.1016/j.pec.2004.11.001.
[33] J. L. Strom and L. E. Egede, “The Impact of Social Support on Outcomes in Adult Patients with Type 2 Diabetes: A Systematic Review,” Curr. Diab. Rep., vol. 12, no. 6, pp. 769–781, Dec. 2012, doi: 10.1007/s11892-012-0317-0.
[34] K. Y. Chan, W. Cockshaw, K. Smith, E. Holmes-Truscott, F. Pouwer, and J. Speight, “Social support and self-care outcomes in adults with diabetes: The mediating effects of self-efficacy and diabetes distress. Results of the second diabetes MILES – Australia (MILES-2) study,” Diabetes Res. Clin. Pract., vol. 166, p. 108314, Aug. 2020, doi: 10.1016/j.diabres.2020.108314.
[35] K. D. Adam et al., “Factors affecting diabetes knowledge in Type 2 diabetic veterans,” Diabetologia, vol. 46, no. 8, pp. 1170–1178, Aug. 2003, doi: 10.1007/s00125-003-1161-1.
[36] F. Fernanda et al., “Relationship between knowledge, attitude , education and duration of disease in individuals with diabetes mellitus,” Acta Paul Enferm, vol. 25, no. 2, pp. 284–290, 2012.
[37] M. Delamater, “Improving Patient Adherence,” Clin. Diabetes, vol. 24, no. 2, pp. 71–77, Apr. 2006, doi: 10.2337/diaclin.24.2.71.
[38] A. Kalungia, M. Mwale, I. S. Sondashi, B. Mweetwa, P. Yassa, and G. Kadimba, “Availability of Essential Antihypertensive and Antidiabetic Medicines in Public Health Facilities in Lusaka District, Zambia,” Med. J. Zambia, vol. 44, no. 3, pp. 140–148, 2017.
[39] H. Kaiser, L. Hehman, B. C. Forsberg, W. M. Simangolwa, and J. Sundewall, “Availability, prices and affordability of essential medicines for treatment of diabetes and hypertension in private pharmacies in Zambia,” PLoS One, vol. 14, no. 12, p. e0226169, Dec. 2019, doi: 10.1371/journal.pone.0226169.
[40] amnath S. Ramanathan, “Correlation of duration, hypertension and glycemic control with microvascular complications of diabetes mellitus at a tertiary care hospital,” Integr. Mol. Med., vol. 4, no. 1, 2017, doi: 10.15761/IMM.1000272.
[41] S. Zoungas et al., “Association of HbA1c levels with vascular complications and death in patients with type 2 diabetes: evidence of glycaemic thresholds,” Diabetologia, vol. 55, no. 3, pp. 636–643, Mar. 2012, doi: 10.1007/s00125-011-2404-1.
[42] T.-C. Li et al., “Glycemic control paradox: Poor glycemic control associated with higher one-year and eight-year risks of all-cause hospitalization but lower

one-year risk of hypoglycemia in patients with type 2 diabetes," Metabolism, vol. 64, no. 9, pp. 1013–1021, Sep. 2015, doi: 10.1016/j.metabol.2015.05.004.
[43] L. Perreault et al., "Sex Differences in Diabetes Risk and the Effect of Intensive Lifestyle Modification in the Diabetes Prevention Program," Diabetes Care, vol. 31, no. 7, pp. 1416–1421, Jul. 2008, doi: 10.2337/dc07-2390.
[44] M. A. M. Jacobs-van der Bruggen et al., "Cost-Effectiveness of Lifestyle Modification in Diabetic Patients," Diabetes Care, vol. 32, no. 8, pp. 1453–1458, Aug. 2009, doi: 10.2337/dc09-0363.
[45] S. Carlsson, N. Hammar, and V. Grill, "Alcohol consumption and type 2 diabetes," Diabetologia, vol. 48, no. 6, pp. 1051–1054, Jun. 2005, doi: 10.1007/s00125-005-1768-5.