

Knowledge of Pharmacists in the Management of Diabetes in a Tertiary Hospital



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Abstract

Background of Study: Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both [1]. Metabolic abnormalities in carbohydrates, lipids, and proteins result from the importance of insulin as an anabolic hormone.

Aim of Study: The study aims to comprehensively examine and assess the knowledge of pharmacists in a tertiary hospital concerning both pharmacological and non-pharmacological interventions in the management of diabetes.

Method: The study was done in FMC, Yenagoa. Convenience sampling was adopted for easy access and convenience. A validated self-reported questionnaire was designed for collection of data on pharmacists' knowledge of diabetes management in a tertiary hospital. The questionnaires were administered to the pharmacists and were informed to retrieve them after a week interval. Data analysis was done using SPSS version 27/Microsoft Excel. Ethical approval was obtained from the ethical committee FMC Yenagoa.

Results: Over half of the pharmacists in FMC were more of the male gender (54.69%) between the ages of 31 and 45 years (45.32%). More than average of them were married (59.38%), while the remaining (40.63%) were single. A higher number of the pharmacists had B. Pharm degrees (96.88%), and only (3.13%) had pharm. D. Also (68.75%) were full-time pharmacists, and the remaining (31.25%) were interns. About (26.56%) had <5 years of experience, (34.38%) of them had 5-10 years of working experience, (39.06%) had >10 years' experience. The participant's defined diabetes was defined as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both [2] (90.75%). They agreed to the fact that diabetes can cause heart, brain, and kidney problems, hypertension, retinopathy, and foot swelling, and also to the fact that type 1 diabetes is due to an autoimmune response (100.00%). They reported the classical symptoms of diabetes as Polyuria, Polydipsia, Polyphagia, and Glucosuria. Also, reported the normal range of Fasting Blood Sugar (FBS) was 70mg/dl-100mg/dl, and random Blood Sugar (RBS) was 125mg/dl or below. The participants agreed that the most prevalent type of diabetes was type 2 diabetes. The participants reported that biguanides, such as metformin were used for obese patients and not suitable in type 1 diabetic patients (100.00%), and over average reported that the maximum dose of metformin is 2g in divided doses (67.19%). Some of the common type 2 antidiabetic drugs used are metformin (100%), glibenclamide (67.19%), glimepiride (23.44%), pioglitazone (6.25%), and chlorpropamide (3.13%). The possible classes of antidiabetic drugs suitable for obese patients were biguanides (100.00%), Sulphonylureas (28.13%), and GLP-1 Agonists (53.13%). Diabetics are to be placed on a special diet with possibly reduced calories and fat but stressed on the fact that diabetics cannot be alone on a diet, but with the aid of medications (75.00%). Most pharmacist always give counseling to diabetics when they come for their refills and checkups (81.25%). Losing weight can help control diabetes in obese patients (100%), and also reduce the risk of having type 2 diabetes.

Discussion: From the findings, the study showed that the pharmacists in FMC Yenagoa exhibited both pharmacological (i.e. the use of antidiabetic drugs) and non-pharmacological (i.e., lifestyle modification, exercise, dieting, weight reduction, etc.) knowledge in diabetes management.

Conclusion: In conclusion, addressing the knowledge gaps among pharmacists in diabetes management within tertiary hospitals is imperative for ensuring optimal patient care. The study successfully investigated pharmacists' knowledge of diabetes management in FMC Yenagoa, Bayelsa State. Although a larger study is needed to clarify the picture further.

Keywords: Diabetes; Bayelsa; Pharmacist; Knowledge; Antidiabetic

Abbreviations: FBS: Fasting Blood Sugar; RBS: Random Blood Sugar; T2D: Type 2 diabetes; BMI: Body Mass Index; MENA: Middle East and West African; CVD: Cardiovascular Disease; DSME: Diabetes Self-Management Education; ENT: Ear Nose and Throat

Background of Study

Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin

secretion, insulin action, or both [1]. Metabolic abnormalities in carbohydrates, lipids, and proteins result from the importance of insulin as an anabolic hormone. Low levels of insulin to achieve

adequate response and/or insulin resistance of target tissues, mainly skeletal muscles, adipose tissue, and to a lesser extent, liver, at the level of insulin receptors, signal transduction system, and/or effector enzymes or genes are responsible for these metabolic abnormalities. The severity of symptoms is due to the type and duration of diabetes. People with diabetes have a higher risk of health problems including heart attack, stroke, and kidney failure [2].

Diabetes can cause permanent vision loss by damaging blood vessels in the eyes. Many people with diabetes develop problems with their feet from nerve damage and poor blood flow. This can cause foot ulcers and may lead to amputation, an increase in the risk of heart disease and stroke, and a 17-fold increase in the risk of renal failure. Diabetes accounts for 50% of all leg amputations performed annually. Thus, diabetes is a major public health problem resulting in over 2 million hospitalizations per year and causing an annual estimated \$20 billion drain on the U.S. economy. Most of this cost is due to the long-term complications of the disease. Any steps that clinicians can take to prevent or postpone these complications will have far-reaching benefits. Some of the diabetes patients are asymptomatic especially those with type 2 diabetes during the early years of the disease, others with marked hyperglycemia and especially children with absolute insulin deficiency may suffer from polyuria, polydipsia, polyphagia, weight loss, and blurred vision. Uncontrolled diabetes may lead to stupor, coma, and if not treated death, due to ketoacidosis or rare nonketotic hyperosmolar syndrome [3].

The prevalence of Diabetes mellitus is increasing globally, the worldwide prevalence was 171 million in the year 2000 and is estimated to rise to 366 million in 2030, but in Nigeria, the prevalence is between 2-7% (WHO, 2016). Urbanization with the adoption of Western lifestyles has been blamed for the increasing prevalence. Evidence shows that dietary and exercise modifications offered to non-diabetic adults can reduce or delay the onset of type 2 diabetes. Diabetes mellitus is common in the elderly in Western countries. In developing countries, it largely affects those between 35-64 years. The latest and most comprehensive calculations show the current global prevalence rate is 6.1%, making diabetes one of the top 10 leading causes of death and disability. At the super-region level, the highest rate is 9.3% in North Africa and the Middle East, and that number is projected to jump to 16.8% by 2050. The rate in Latin America and the Caribbean is projected to increase to 11.3% (IHME, 2023).

Diabetes was especially evident in people 65 and older in every country and recorded a prevalence rate of more than 20% for that demographic worldwide. The highest rate was 24.4% for those between ages 75 and 79. Examining the data by super-region, North Africa and the Middle East had the highest rate at 39.4% in this age group, while Central Europe, Eastern Europe, and Central Asia had the lowest rate at 19.8%. Almost all global cases (96%) are type 2 diabetes (T2D); all 16 risk factors studied were associated with T2D. High body mass index (BMI) was the

primary risk for T2D - accounting for 52.2% of T2D disability and mortality - followed by dietary risks, environmental/occupational risks, tobacco use, low physical activity, and alcohol use (IHME, 2023).

Some studies have shown that there is a relationship between the knowledge of Diabetes mellitus and certain socio-demographic variables (Gholamreza et al, 2010; Zanchetta et al, 2016). For example, being in high school or university, and having high socioeconomic levels were found to be associated with higher levels of knowledge. Patients' views or perceptions of their illness seem to be an important variable affecting their health behavior and ultimately their overall management. Research has indicated that illness perceptions are important determinants of behaviors associated with type 2 diabetes is considered a disease of poor lifestyle with physical inactivity, obesity, and urbanization contributing to the increased prevalence of the disease in contrast to type 1 diabetes which is a genetically caused autoimmune disease [4]. Diabetes education and diabetes self-management education, as well as ongoing support, are important components of diabetes care [5]. Patient participation is important in the management of diabetes. Education empowers people living with diabetes to manage their disease, improve health goals and outcomes, as well as contributing to the care of other patients. Different aspects of diabetes management demand lifestyle changes, self-monitoring of treatment, and prevention of complications. The high prevalence rates of Diabetes mellitus shown by many epidemiological studies were used as an advocacy tool to improve Diabetes mellitus-related health services, especially in the primary healthcare sector. Consequently, many Middle East and West African (MENA) states have witnessed improved clinical care of patients with Diabetes mellitus [6].

Research shows that women living with diabetes may be at higher risk for developing cardiovascular disease (CVD), than men, and that mortality from both coronary heart disease and stroke is greater in women than in men with diabetes [7,8]. The prevalence of mental illness such as depression and anxiety disorders are also greater in women compared to men living with diabetes [9]. The impact of these disorders adversely affects self-care behaviors, glycemic control, quality of life, and diabetes complications. The greater risk of complications in women compared to men may be due to differences in how women experience and manage their diabetes. While it is well established that diabetes self-management education (DSME), a complex health intervention, is generally effective at enhancing self-care behaviors, improving glycemic control, lowering health care costs, and improving quality of life, the specific impact of DSME features on outcomes has not been thoroughly evaluated particularly for specific cultural and gendered populations [10,11].

Management of diabetes patients requires the active involvement of many healthcare providers, including a pharmacist. Pharmacists specialized in this growing chronic condition can have a significant and positive impact on the quality

of life of the patients as well as healthcare systems (Davis et al., 2005). Awareness of healthcare providers on the need to assess and monitor the patient's quality of life as an important outcome in diabetes management has increased. The quality of life is an important outcome since it influences the patient's self-care activities which can have a positive contribution to diabetes control (Khan et al., 2005). Many pharmacist intervention programs have been established in various countries to enhance clinical outcomes and quality of life. These programs were implemented by pharmacists, with the cooperation of physicians and other health care providers. Pharmacist interventions and the expanded role of pharmacists are associated with many positive diabetes-related outcomes, including improved clinical measures, improved patient and provider satisfaction, and reduced treatment costs. Subsequently, the pharmacist can contribute to an improvement in the quality of life of patients with diabetes by informing and educating patients, answering their questions, and, at the same time, monitoring the outcomes of their treatment (Hawkins et al., 2002). Many studies on adherence to medication and the ways to improve it have been conducted yet it remains significantly low. However, non-adherence to treatment represents a missed opportunity for health gain and a waste of resources (Atkins and Fallowfield, 2006).

Aim of Study

The aim of the study is to comprehensively examine and assess the knowledge of pharmacists concerning both pharmacological and non-pharmacological interventions in the management of diabetes.

Method

Study Site

Federal Medical Centre Yenagoa also known as FMC Yenagoa is the biggest and outstanding Hospital in the Heart of Yenagoa situated in Bayelsa State, Nigeria. It provides a comprehensive and prompt health care delivery system. Their services range from mother and child delivery to Optometric, Ear Nose and Throat (ENT), Orthopaedic, Mental Health, etc. The facility has a big pharmacy with eight (8) sub-pharmacy units located in different wards, Accident & Emergency, Paediatric, Outpatient Department, Obstetrics & Gynaecology, Surgical, Orthopedics, Medical ward, and Mental Health Unit.

Study Population

Consenting pharmacists in Federal Medical Center Yenagoa Bayelsa State. There are seventy-nine (79) pharmacists in Federal Medical Center Yenagoa.

Study Design

A Validated self-reported questionnaire was designed and used to achieve the aforesaid objectives. The questions were designed using validated methods and related journal articles.

Study Tools and Measures

The study was conducted at the Federal Medical Center in Yenagoa, Bayelsa state. This was a qualitative study with results drawn from a reasonable sample size. A validated questionnaire was developed and used as the research tool for achieving the objectives of the study. The questionnaire contained four (4) sections. Section A included the respondent's demographic. Section B, knowledge of pharmacists in Diabetes Mellitus. Section C, the knowledge of pharmacists in the pharmacological interventions available in diabetes management and section D contained the knowledge of pharmacists in the non-pharmacological management available in diabetes management. The questions were created using validated methods and related journal articles. The participant information sheet and consent form were created based on the Ethics Committee template used by the Federal Medical Center Yenagoa. This technique has been used to measure the prevalence of health outcomes by providing preliminary data in the planning of a future advanced study (Asborg et al., 2020; Xiaofeng & Cheng, 2020; Tarun et al., 2017).

Sample Size Calculation/Power Calculation

The sample size was calculated using the Taro Yamene's formula.

$$n = N / [1 + N(e)^2]$$

Where; n= Signifies the sample size.

N Signifies the population under study.

e= Signifies the margin of error (0.05).

$$n = 64 / (1 + 64(0.05)^2)$$

$$n = 64 / (1 + 64(0.0025))$$

$$n = 64 / (1 + 0.16)$$

$$n = 64 / 1.16$$

$$n = 55.17$$

We can see from the result above that the sample size is 55.17, rounded off to 55 from the total population of 64 which is the lower number of responses from the respondents to maintain a 95% confident interval.

Sampling Technique

Convenience sampling was used to select participants to enhance the rigor and generalizability of this study. This method provides an easier way to assess the pharmacists.

Data Collection/Procedure

The validated questionnaires were distributed all around the eight (8) sub-pharmacy departments in the facility. The questionnaires were administered to the pharmacists and

informed to retrieve them after a week interval. They were collected after a week and proper data analysis was done.

Data Analysis

The data generated was analyzed using Statistical Package for the Social Sciences (SPSS) version 27 and/or Microsoft Excel. The results were presented using descriptive statistics and expressed as simple percentages.

Inclusion Criteria

- i. All consenting staff pharmacists in Federal Medical Center Yenagoa.
- ii. Intern pharmacist at Federal Medical Center Yenagoa.

Exclusion Criteria

- i. Pharmacy Students on industrial training.
- ii. Pharmacists are not staff of Federal Medical Center Yenagoa.

- iii. non-consenting pharmacists.
- iv. Pharmacy technicians.

Ethical Considerations

The study was approved by the Ethics Committee of the Federal Medical Center Yenagoa and the Bayelsa State Ministry of Health. The study met all ethical requirements concerning human subjects, as adopted by the 18th World Medical Assembly, Helsinki, Finland, Federal Medical Center Yenagoa Research Ethics Committee, and Bayelsa State Ministry of Health, Ethics Committee.

Results

Demographic Description of Pharmacists in FMC, Yenagoa, Bayelsa State

According to this study, pharmacists in FMC were more of the male gender (54.69%) between the ages of 31 and 45 years (45.32%). Most of them were married (59.38%) with B. Pharm degrees (96.88%). This is shown in table 1 below.

Table 1: Demographic description of pharmacists in FMC, Yenagoa, Bayelsa State (N=64).

		Count	%
Gender	Male	35	54.69
	Female	29	45.31
Age	20-30	20	43.48
	31-45	29	45.32
	46-60	15	23.44
	Above 60	0	0
Marital status	Single	26	40.63
	Married	38	59.38
Type of staff	Intern	20	31.25
	Pharmacist	44	68.75
Education	B. Pharm	62	96.88
	Pharm. D	2	3.13
Years of experience	<5	22	34.38
	10-May	25	39.06
	>10	17	26.56

Knowledge of Diabetes among Pharmacists in FMC, Bayelsa State

The knowledge of diabetes among pharmacists in FMC Yenagoa was also reported. Most of the respondents defined diabetes as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both (93.75%). They also reported that diabetes can cause heart, brain, and kidney problems, and can cause hypertension, retinopathy, and foot swelling (100.00%). Respondents also reported that type 1 diabetes is due to autoimmune response (100.00). Classical

symptoms of diabetes, as reported were Polyuria, Polydipsia, Polyphasia, and Glucosuria. The respondents reported the normal range of Fasting Blood Sugar (FBS) as 70mg/dl-100mg/dl, Resting Blood Sugar (RBS) as 125mg/dl or below, two-hour plasma glucose level as 140mg/dl or below, and of HbA1c levels as 5.7mg/dl or below. The respondents also reported that the most prevalent of diabetes type was type 2 diabetes which is most common even in old age, and that both type 1 and type 2 diabetes are associated with the destruction of beta cells. Respondents also agreed that diabetes can lead to blindness and fainting as

symptoms but reported not to have done any intervention in cases of such emergencies. Slow wound healing among diabetic patients, and weight loss due to fat and muscle depletion for

energy were also reported. Almost all the response patterns to the above agreement were given between 89.06% and 100%. This is contained in table 2 below.

Table 2: General Knowledge of Diabetes among Pharmacists in FMC, Bayelsa State (N=64).

		Count	%
Metabolic disorder characterized by hyperglycemia	Yes	60	93.75
Is diabetes a metabolic disease condition?	Yes	61	95.31
	No	3	4.69
Is diabetes a lifelong disease?	Yes	64	100
Can diabetes cause heart, brain, and kidney problems?	Yes	64	100
Can diabetes cause hypertension?	agreed	63	98.44
Can diabetes cause foot swelling?	agreed	62	96.88
Which of these is due to autoimmune response?	type 1	64	100
Does diabetes cause retinopathy?	agreed	46	100
Are you aware of the classical symptoms of diabetes?	Yes	64	100
If yes, mention four (4) of them?	Yes	0	0
Polyuria	Yes	64	100
Polydipsia	Yes	64	100
Polyphasia	Yes	64	100
Glucosuria	Yes	64	100
Do you have knowledge of a normal range of Fasting Blood Sugar (FBS) levels	Yes	64	100
If yes, what's the normal range?	70mg/dl-100mg/dl	64	100
Do you know the normal range of Random Blood Sugar (RBS) levels?	Yes	64	100
If yes, what's the normal range?	125mg/dl or below	64	100
Do you know the normal range of two-hour plasma glucose levels?	Yes	64	100
If yes, what's the normal range?	140mg/dl or below	64	100
Do you know the normal range of HbA1c levels?	Yes	64	100
If yes, what's the normal range?	5.7mg/dl or below	64	100
Which type of diabetes is the most prevalent?	type 2	64	100
Which of these is associated with the destruction of beta cells?	type 1	58	90.63
	type 2	6	9.38
Which type of diabetes is mostly associated with old age?	type 1	0	0
	type 2	64	100
Can diabetes lead to blindness?	agreed	64	100
Do you know what to do in a diabetes emergency?	Yes	57	89.06
	not sure	7	10.94
Is Type 2 diabetes hereditary?	not agreed	64	100
Does hypoglycemia cause fainting?	agreed	64	100
Can diabetes be tested using urine?	not sure	64	100
Do diabetic patients come down with slow wound healing?	Yes	64	100
Is diabetes a life-threatening disease?	agreed	64	100
Which class of diabetes is termed insulin-dependent?	type 1	64	100
What do you think causes weight loss in diabetic patients? The blood sugar is not used as energy, so the body burns fat and muscles for energy	Yes	64	100

Knowledge of Pharmacological Management of Diabetes

Most of the respondents reported that the drug, insulin, which comes in a subcutaneous injection form, and which sometimes causes hypoglycemia, cannot be used for both type 1 and type 2 diabetes (75.00%). Biquanides, such as Metformin were reported

to be used for obese patients and not suitable in type 1 diabetic patients. All the respondents supported the idea that antidiabetic drug adherence is likely to improve therapeutic outcomes (100%). The respondents reported that the most common antidiabetic drugs used in the facility are metformin (100.00%), glibenclamide (67.19%), glimepiride (23.44%), pioglitazone (6.25%), and chlorpropamide (3.13%). This is contained in table 3 below.

Table 3: Knowledge of pharmacological management of diabetes (N=64).

		Count	%
Can Insulin be used for both Type 1 and Type 2 Diabetes?	Agreed	16	25
	Not agreed	48	75
What is the common dosage form of insulin?	Injection	64	100
	Tablet	0	0
	Suspension	0	0
What's the route of administration of insulin	Others	0	0
	Sc	64	100
	Agreed	37	57.81
Does Insulin cause hypoglycemia?	Not agreed	27	42.19
	Metformin	64	100
Which of these drugs belong to biguanides?	Glimepiride	0	0
	Pioglitazone	0	0
	Agreed	64	100
It's metformin suitable for obese patients?	Agreed	12	18.75
Can metformin be recommended in type 1 diabetes?	Not Agreed	52	81.25
	Agreed	64	100
Does adherence improve therapeutic outcomes?	Agreed	64	100
Does glibenclamide cause weight gain?	Agreed	64	100
	Metformin	64	100
	Glibenclamide	43	67.19
	Glimepiride	15	23.44
	Pioglitazone	4	6.25
Common drugs for type 2 diabetic patients	Chlorpropamide	2	3.13
	Biquanides	64	100
	Sulphonylureas	18	28.13
	GLP 1 Agonist	34	53.13
	Glibenclamide	64	100
Diabetic drug classes for the obese	Glimepiride	52	81.25
	Glipizide	12	18.75
	2g	43	67.19
What's the maximum dose of metformin?	3g	14	21.88
	4g	7	10.94
	Unit/ml	53	82.81
Insulin injection is in?	mg/ml	11	17.19
	g/ml	0	0

Knowledge on Nonpharmacological Management of Diabetes

The study respondents reported that diabetics are to be placed on a special diet with possibly reduced calories and fat, but stressed the fact that diabetics cannot be alone on a diet, but with the aid of medications (80.43%). They agreed to the fact that losing weight can help control diabetes in obese people (73.91%), diabetic patients should not take alcohol (58.70%), and not eat

meals rich in sugar (73.91%). Pharmacists in the study also claimed that they always give counseling to diabetics when they come for their checkups (89.13%). Patient education (73.91%), the effect of smoking, and food choices of concern were also reported in the study. This is contained in table 4 below.

Table 4: Knowledge of Nonpharmacological management of diabetes (N=64).

		Count	%
Are diabetic patients placed on a special diet?	Yes	64	100
Does reducing calorie and fat intake help control diabetes?	Yes	61	95.35
	Yes	12	18.75
Can diabetes be treated without the use of medication?	No	48	75
	Not Sure	4	6.25
Do regular physical exercises help control diabetes?	Yes	64	100
Does losing weight help control diabetes in obese people?	agreed	64	100
	Yes	0	0
Is it okay for diabetic patients to take alcohol?	not sure	27	42.19
	No	37	57.81
Do you think taking alcohol worsens their diabetic condition?	Yes	64	100
	Yes	48	75
Does eating meals rich in sugar increase blood sugar levels?	not sure	9	14.06
	No	7	10.94
Do you counsel patients whenever they come for checkups?	always	52	81.25
	Rarely	12	18.72
Have you ever educated diabetic patients on disease conditions?	Yes	59	92.19
	not sure	5	7.81
Can smoking increase blood sugar levels?	agreed	41	64.07
	not agreed	5	10.87
Foods that need to be avoided by diabetic patients.			
		43	67.19
		47	73.44
		23	35.95
		36	56.25
Do you think weight reduction increases insulin sensitivity?	yes	41	64.06
	not sure	23	35.94

Discussion of Key Findings

Over half of the pharmacists in FMC were more of the male gender (54.69%) between the ages of 31 and 45 years (45.32%). A similar study was carried out in King Saud Hospital, Unaizah City, where the majority of the pharmacists were males which comprised the total percentage of 88.9% (A Alkhoshaiban,

2019). More than average of them were married (59.38%), while the remaining (40.63%) were single. A higher number of the pharmacists had B. Pharm degrees (96.88%), and only (3.13%) had pharm. D. Also (68.75%) were full-time pharmacists, and the remaining (31.25%) were interns. The findings showed, (26.56%) had <5 years' experience, (34.38%) of them had 5-10 years working experience, (39.06%) had >10 years' experience.

From the study, diabetes was defined as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both [2] (90.75%). The findings agreed to the fact that diabetes can cause heart, brain, and kidney problems, hypertension, retinopathy, and foot swelling. Yadav, R. (2019), did a market survey among 150 diabetic patients from different hospitals and clinics in Rajbiraj Saptari Nepal, to check which complication exists in the highest ratio among the patients. Out of 150 patients, 65 (43.33%) patients suffered from cardiac autonomic neuropathy, 57 (38%) patients suffered from diabetic retinopathy, and 28 (18.66%) patients suffered from diabetic foot ulcers. Findings showed that type 1 diabetes is due to an autoimmune response (100.00%). The study discovered that the classical symptoms of diabetes were Polyuria, Polydipsia, Polyphagia, and Glucosuria. Also, the results showed that the normal range of Fasting Blood Sugar (FBS) is 70mg/dl-100mg/dl, Random Blood Sugar (RBS) is 125mg/dl or below, two-hour plasma glucose level is 140mg/dl or below, and of HbA1c levels is 5.7mg/dl or below.

Findings showed that the most prevalent type of diabetes was type 2 diabetes which is most common even in old age. This corresponds with the findings of Bullard & KM [12] and Forouhi et al. [13], but contradicts Pettitt et al. [14] findings, which said that type 1 was the most prevalent; this could be because the research work was based on youths <20 years and the sample size being smaller. Almost all the response patterns to the above agreement were given between 89.06% and 100%. The findings showed that type 1 diabetes is associated with the destruction of beta cells (90.63). The drug, insulin, which comes in a subcutaneous injection form, and which sometimes causes hypoglycemia, cannot be used for both type 1 and type 2 diabetes (75.00%). The study confirmed that biguanides, such as Metformin were used for obese patients and not suitable in type 1 diabetic patients (100.00%).

Findings from this study showed that the maximum dose of metformin is 2g in divided doses (67.19%). All the respondents supported the idea that antidiabetic drug adherence is likely to improve therapeutic outcomes (100%). The study showed that some of the common type 2 antidiabetic drugs used are metformin (100%), glibenclamide (67.19%), glimepiride (23.44%), pioglitazone (6.25%), and chlorpropamide (3.13%), which corroborates the findings of [15], where metformin was the single most frequently prescribed antidiabetic agent (66.8%) followed by the sulfonylureas group (37.4%). The possible classes of antidiabetic drugs suitable for obese patients were biguanides (100.00%), Sulphonylureas (28.13%), and GLP-1 Agonist (53.13%).

The findings showed that diabetics are to be placed on a special diet with possibly reduced calories and fat, but stressed the fact that diabetics cannot be alone on a diet, but with the aid

of medications (75.00%). It was discovered that losing weight can help control diabetes in obese patients (100%), and also reduce the risk of having type 2 diabetes for obese individuals who have not been diagnosed with it. Closely related are studies carried out by Si et al. [16], Williamson et al. [17], and Harder et al. [18] which found that a low-calorie diet leads to weight loss and reduces the risk, and also improves glycemic control. Diabetic patients should not take alcohol (57.81%), and not eat meals rich in sugar (75.00%).

Findings showed that most pharmacists always give counseling to diabetics when they come for their refills and checkups (81.25%). The study agreed that weight reduction increases insulin sensitivity, leading to reduced plasma glucose levels (64.06). Patient education and counseling on adherence, lifestyle modification, exercise, weight reduction, and dieting are essential non-pharmacological tools in diabetes management. From the findings, the study showed that the pharmacists in FMC Yenagoa exhibited both pharmacological (i.e. the use of antidiabetic drugs) and non-pharmacological (i.e., lifestyle modification, exercise, dieting, weight reduction etc.) knowledge in diabetes management. This does not corroborate the findings of (Shrestha M, 2015), a similar study carried out in Nepal, although this study was based on community pharmacies of which some had just diplomas in pharmacy-related courses. By contrast, a similar study carried out in Qatar showed average knowledge of diabetes management [19]. A cross-sectional study, conducted from 01 March to 30 September 2017 including all pharmacists in the Dakar region who agreed to participate in the survey, showed that pharmacists in Dakar region lack knowledge of diabetes. However, attitudes and practices are considered satisfactory in the management of diabetes [20].

Conclusion

In conclusion, addressing the knowledge gaps among pharmacists in diabetes management within tertiary hospitals is imperative for ensuring optimal patient care. The study successfully investigated pharmacists' knowledge in diabetes management in FMC Yenagoa, Bayelsa State. Although, a larger study is needed to clarify the picture further [21-74].

Recommendations

- i. Implement structured and ongoing education and training programs specifically tailored to diabetes management for pharmacists.
- ii. Encourage interdisciplinary collaboration between pharmacists, physicians, nurses, and other healthcare professionals involved in diabetes care.
- iii. Clinical Rotations and Experiential Learning.
- iv. Empower pharmacists to take an active role in patient education by providing resources, tools, and counseling support.

v. Encourage pharmacists to engage in research activities related to diabetes management to contribute to the evidence base and advance best practices in the field.

Contribution to literature

This study's findings have contributed to an existing body of knowledge that cough and other minor reasons are implicated in the knowledge of diabetes management in this part of the world.

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Conflict of Interest

The researchers declare that there was no conflict of interest.

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