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The Importance of Health Literacy Related to Medications Instructions to Promote Adherence in People Living with Cardiovascular Diseases at Rural Settings

Charity Ngoatle and Tebogo Maria Mothiba

Abstract

Health literacy related to prescribed medications instructions is the ability to read, understand and carry out medication instructions as directed. Being generally literate does not automatically make one to be health literate. In most cases, a person's health literacy is overlooked based on their good general literacy. A convergent parallel mixed method design was used to explore and describe the practices of diabetes mellitus patients regarding prescribed medications instructions. The results showed failure to interpret medications instructions which leads to non-adherence unaware. On the other hand, non-adherence led to complications. Enhancing health literacy includes explanation of the medication instructions in details including the exact times for medication consumption. This could be achieved through peer teaching, health talks with patients and workshops.

Keywords: health literacy, prescribed medications, instructions, non-adherence, diabetes patients

1. Introduction

Health literacy regarding medications instructions is important to people with cardiovascular diseases. Understanding medication instructions is of vital importance to people living with cardiovascular diseases for proper disease management. Taking medication properly is one of the critical aspects in the control of diabetes mellitus. Many people can read medication instructions simply because they are literate; however, patients fail to interpret the medication instructions because they are health illiterate. Even though basic general literacy plays a role in understanding phenomena in general, health literacy regarding medications instructions could be achieved even when an individual do not have general literacy. So, patients with low health literacy have shown to suffer from low medication knowledge and understanding [1]. Health literacy regarding medication instructions basically means 'an understanding of the actual meaning of the instructions on how medication should

be consumed'. This chapter will be based mainly on the study conducted among diabetes mellitus patients on treatment at selected rural area in Capricorn District, Limpopo province, South Africa.

The study employed a convergent parallel mixed method research design. The total population was 144 patients; 18 participated in the semi-structured interviews for qualitative study and 137 respondents for the quantitative study. The major findings of the study were: misconceptions and misunderstanding, unclear instructions, poor explanation by medication dispensers, non-compliance, negligence, experiencing complications, lack of knowledge and need assistance. The study also outlined the demographic data of the participants as factors influencing adherence and more insight will be shared in the chapter.

2. What is general literacy, health literacy, and literacy related to medication instructions?

General literacy refers to the basic ability to read, write, and figuring things out without considering the background in which reading, and writing occurs [2]. **Health literacy** on the other hand refers to the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services necessary to make proper health decisions" [3]. Although general literacy has an impact on health literacy, being generally literate does not necessarily mean one will understand the health language. However, [4] asserts that the degree of health illiteracy related to medication instructions was linked to low education level. **Medication instructions** refers to the detailed information on how medication should be taken [5]. These instructions are normally found on the medication packages, bottles, inserts etc.

2.1 Types of health literacy

Health literacy is the junction between general literacy, health, and health care, but also incorporate attributes of the other types of literacies to varying degrees [6]. The concept of health literacy stemmed from the concern that individuals need more than just having general literacy skills to be able to manage the complexities of health and health system issues. There is a considerable intersection between general literacy and health literacy. Nonetheless, there are strong health-specific demands involved in health literacy that differs from those in general literacy [6]. Therefore, having general literacy alone is not adequate if one has to live a healthy life and to be able to prevent, manage, and control diseases and illnesses.

Therefore, health literacy is divided into three levels namely; basic health literacy, communicative health literacy, and critical health literacy [3].

2.1.1 Basic/functional health literacy

Functional health literacy is characterised by adequate fundamental skills in reading and writing to enable an individual to function efficiently in everyday situations. Therefore, functional health literacy is important to access services and information required to support individual's health, such as reading information about medication on medication labels [3]. Inadequate health literacy can result in difficulty following instructions from a doctor, and taking prescribed medication incorrectly, nonetheless, medical information is well

understood when provided slowly, with the use of simple words and avoiding more information at a time [7].

2.1.2 Communicative/interactive health literacy

Interactive health literacy refers to more advanced, cognitive, and literacy skills which, together with social skills, that could be employed to actively participate in everyday activities. These skills are used to excerpt information and derive meaning from different forms of communication, and to apply new information to changing circumstances [3]. The interactive health literacy approach improves individuals' capability to act autonomously on knowledge. So, patients with inadequate health literacy are less likely to understand and take part in disease prevention and health promotion programs [7]. These patients are likely to be hospitalised more often than those with adequate health literacy.

Patients who reported having confidence in the ability to take medications confirmed a lack of comprehension in understanding medication instructions [8]. Patients further indicated numerous obstacles to effective medication management embedded in poor communication. Hence, patients expressed favouritism for more clearer medication instructions which could address some of the challenges they face.

2.1.3 Critical health literacy

Critical health literacy includes advanced cognitive skills, which together with social skills can be applied to critically analyse information and to use that information to exercise greater control over life events and situations. Therefore, health literacy moves beyond communication to the development of skills necessary to effect social change to support health [3].

From these types of health literacy descriptions, [9] came up with a framework for health literacy (**Table 1**) as follows:

Types of health literacy	Nutbeam's (2000) definitions	Categories of analysis
1. Functional health literacy	An individual capability to seek and comprehend health information.	The ability to recognise the formation of physical activity patterns in daily life.
2. Interactive health literacy	An individual capability to put health information into practice to achieve good health outcomes in various daily practices.	The ability to put to practice the comprehension of how physical activity patterns are made, and to employ, and exercise a lively everyday lifestyle within the prevailing. Conditions.
3. Critical health literacy	Possessing skills to critically evaluate health information and utilise information to achieve maximum control, including addressing structural determinants of health including empowerment skills; capabilities to act to bring change in conditions for ones' health and others.	The capability to relate judgements to physical activity recommendations, to comprehend the effect of social determinants on physical activity ranks, and to draw on these capabilities to bring change to the prevailing conditions in enhancing the acceptable everyday lifestyle for self and others.

Table 1.
Health literacy framework.

2.2 Characteristics of individuals with low health literacy

- Poor overall health status.
- Higher rates of hospitalisations, death, and longer hospital stay.
- Higher rates of hospital readmissions within three days of discharge.
- Decreased capacity to manage chronic diseases.
- More likely to make errors with medications.
- Seek medical care when they are more ill.
- Have less knowledge on own illness management [6].

2.3 Factors influencing health literacy and medication adherence

Research has shown that there are several factors which influence health literacy among individual groups.

1. **Poor labelling instructions** on medication, packaging, lack of patient teaching on medication use, and disease processes contribute to non-adherence [10]. Patients therefore do not see the importance of following correct medication therapy because they do not understand.
2. **Gender** - Sixty-eight percent (68%) of the study participants were females. This could be because most women tend to report a lot of health issues and have greater utilisation of medical services than men [11]. Furthermore, this can be due to the traditional role of caring for sick family members and children. This traditional gender anticipation offers women with more interactions with the healthcare system, providing them additional chances to build their knowledge base, and consequently resulting in increased levels of health literacy than those of men. Gender differences in health literacy among Korean adults revealed that Korean women had a significantly higher level of health literacy compared to men, in understanding instructions on medication bottles [11]. The study explored gender differences in the level of health literacy and appropriate factors linked with health literacy.

However, women reported more depressive symptoms of chronic diseases than men [11]. A question could be raised as to why these women would suffer depressive symptoms while we expect them to be healthy and in control of their diseases since they report frequently to the health facilities. This could be that, when women are sick, they lack proper care from their spouses or anyone to care for them, or they could be inappropriately taking their medications.

3. **Educational level** – Most of the diabetes mellitus patients (47%) attended school up to high school whereas only 11% did not attend school at all.

Observations from previous studies illustrate that individuals with higher socioeconomic status or higher education levels had a better comprehension of prescribed medications and medication labels hence leading to the minor occurrence of adverse medication occasions [12]. Despite this, failure to comprehend and interpret medication prescriptions is still prevalent through all

educational levels [12]. However, it is evident that a bit of general literacy plays part in augmenting health literacy. This was observed in patients who used many sources of medication information and found to be more informed than those who relied on one information source, for instance, using medication labels only while others used also some internet, books, and leaflets [12].

Having attained higher educational qualifications together with a family history of diabetes mellitus was significantly concomitant with a better understanding of health teaching and instructions [13]. It is evident that having enough health literacy is not the only factor related to good glycaemic control, rather the effect of adequate health literacy in attaining good glycaemic control can be disguised by patients with a better understanding of health education and instructions [13]. Therefore, patients can be health literate, but still, fail to comprehend medication instructions.

4. **Age** – Eighty-two percent (82%) of the participants were 50 years and above. It is well known that the risk of diabetes mellitus especially Type 2 is associated with age. However, as people age, their memory also deteriorates which could affect medication instructions comprehension. So, age has not been identified as a feature in the misapprehension and misinterpretation of prescription medication and medication labels. Misunderstanding was common across all age groups. Hence a more specific and clearer explanation is needed for the diabetes mellitus patients to understand medication instructions. Conversely, research affirms that health literacy is a durable predictor of health outcomes than socio-economic status, age, or ethnic background [6].
5. **Complexity of medication therapy** – fifty percent (50%) of the respondents were using four and more drugs for diabetes and other comorbidities. Diabetes patients on complex regimen were three times non-adherent than those with a simple regimen [14]. Therefore, simplifying diabetic medication therapy to at least single or two medications could make it easier for patients to follow [14].
6. **Poor health literacy** - other contributory factors to non-adherence in diabetes mellitus patients were identified as follow: firstly, poor health literacy coupled with low health numeracy [15]. This is irrespective of whether an individual is generally literate or not. Secondly, deficient or unclear teaching on medication, particularly if the teaching is not personalised for the patient or on each medication. Some patients do not interpret medication labels and medication information correctly and this is common even when labelling requires minimal reading skills. For example, instructions to take medicine twice daily (which is vague since 'daily' means once per day), or every 12 hours means individuals should make further decisions to understand the instructions. "Take medication as directed" is further, more difficult to interpret since the instructions need to be further broken down. Patients are more likely to understand more specific medication administration times such as 08 A.M., 06 P.M. but instituting periods can be useful or suit some individuals better. Using multifaceted medication regimens independently predicts the probability that patients interpret medication instructions, advice, or education incorrectly.

Health professionals are the major role players in disseminating health information and are the first and most precise sources of information in health-related matters. Although they have restricted time with patients during consultations, they fail to issue out information as expected and patients opt for sources with questionable credibility, such as the internet, television, and

newspapers, for health information [16]. These defective sources mostly lead individuals into making erroneous verdicts about their health. The patients should be taught how to seek credible information sources on the media. There should be ever-ready more specific and detailed health information materials to give out to the patients to reference at home (*see appendix 1*).

7. Inadequate patient education related to medication use - Research has also shown that medication non-adherence and treatment ineffectiveness can be negatively influenced by the inability to comprehend medication instructions. The problem is not with patients using medications only but also dispensing health practitioners and medication manufacturers. Most of the generally used medication label instructions are unclear, and misunderstanding takes place also in highly educated patients [17]. Poor understanding of medication instructions or misinterpretations could be a cause for patients not using their medications as prescribed. Misinterpretation of medication instructions leads to subprime medication therapy resulting from consuming less than instructed, getting insufficient medication concentrations, or increased risks of adverse effects by overdosing and medication concentration increasing interactions.

It is evident that inadequate health literacy hinders patients' understanding of medication instructions [18]. The instructions also could be written in the clearest and specific manner, however, there is limited evidence supporting the best practices for writing prescription medication instructions to enhance patients' comprehension for proper use of the medication. Therefore, a more specific wording should be used on prescription medication instructions to enhance patients' comprehension [18].

3. Impacts of poor health literacy of medication adherence

Most of the time medication dispensers think that patients understand the instructions given to them regarding their medications but that is not always the case. Health literacy regarding medication instructions is a subject on its own, which needs to be unpacked. Health literacy do not always need basic literacy skills, if the individual understands the clock she or he is covered.

3.1 Misconception and misunderstanding

Misconception or misunderstanding could lead patients to non-adherence to their medication. Diabetes mellitus patients had misconception and misunderstanding regarding the prescribed medication instructions [19]. The instructions did not have specific times at which medications should be consumed. The instructions on the medication packages are not adequate; for instance, the instructions were written as morning, noon, night, or two times a day etc. [20]. This kind of instructions may be dangerous because patients with poor health literacy would interpret them wrongly [20]. Patients end up with drug toxicity or underdose. Patients also had incorrect perception of the medication instructions where the patients do not fully understand the instructions [21].

3.2 Non-compliance

One of the major problems responsible for non-adherence is the fact that patients esteem themselves as understanding the instructions. Diabetes mellitus

patients perceived themselves as understanding the medication instructions which is however contrary to how they “actually” carried them out [19]. Understanding medication instructions means taking medication correctly and that includes taking the correct dose, at the right frequency, being persistent and consistent [21]. Non-adherence is linked to increased health services utilisation and frequent hospitalisation [22]. Many of the diabetes mellitus patients demonstrated a knowledge discrepancy concerning medication use during disease treatment [23]. This lack of knowledge can aggravate the health state of people with diabetes mellitus. Subsequently, bring about a momentous increase in direct and indirect health costs.

Non-compliance is often coupled with patient’s negligence. Diabetes mellitus patients often drink too much alcohol and when drunk, do not take their prescribed medications. Similar situation is recorded in [24] where non-compliance was linked to patients not giving attention to their health with double increase in non-compliance due to alcohol use.

On the contrary, most patients were non-compliant because they had poor health literacy either because of shallow explanations given by health professionals or the unclear medication instructions on medication packages, leaflets or doctor’s prescriptions.

3.2.1 Shallow explanations by professional nurses

Professional nurses as medication dispensers at primary health care level need to give a full explanation of the medication instructions to the patients. (Refer to **Table 3**). Diabetes mellitus patients do however indicate that they do not get such explanations as expected. **Participant ‘G’** when asked to share how she was told to take their medications said, “No. They have never explained well to me, but they said I should take the medication in the morning, during the day, and when I go to sleep”. **Participant ‘E’** also said, “They said I should take the medication the way they are; but for the times and hours no. They just said in the morning, during the day, and at night”.

In other words, patients do adhere to what the professional nurses tell them however, that information given to them is incomplete. This incomplete explanation therefore contributes to patients not adhering to treatment.

3.2.2 Unclear medication instructions on medication packages, leaflets or doctor’s prescriptions

The medication instructions on the leaflets, packaging, and doctors’ prescriptions are not clear. There is a poor explanation of the time-frequency on the documents’ medication instructions. **One drug is written as**, “1mg once daily”. **Another one is written**: “One 500mg tablet 2 to 3 times a day”. There is no time interval reflected on the doctor’s prescription, medication leaflets, and packaging. The drugs are written as follows: “One 850mg tablet twice a day”. **Another drug is written**, “40 to 80mg daily”. **Whereas another one is written**, “Daily doses over 10mg in 2 divided doses”. there are no specific times for taking medication on diabetic medication instruction documents. One drug is written as, “Doses of 160mg daily in 2 divided doses”. Another one is written: “Should be taken the same time every day”.

The medication instruction does not specify the exact times for taking the medications. **One drug is written as**, “Doses of 160mg daily in 2 divided doses”. **Another one is written**: “Should be taken the same time every day”.

Doctors should clarify medication instructions to patients and if they fail to do so, the pharmacists and professional nurses should, when dispensing [11]. If the health professionals fail, the last resort would be the medication packages and accompanying print materials like container labels, package inserts, medication

Symptoms experienced	Agree	Neutral	Disagree
Changes in vision	59	8	70
Numbness	60	7	70
Tingling sensation	47	4	86
Burning/pain on the toes or fingers	54	3	80
Erectile dysfunction in men	17	6	34
Poor hearing	18	2	117
A wound that does not heal	7	2	128

Table 2.
The symptoms experienced by diabetes mellitus patients on treatment.

guides etc. however, the print materials have been found to be complex and written in medical language which patients do not understand irrespective of their literacy level [25]. Most the patients on diabetes medications are elderly. It will serve us right as health professionals to write or tell the patients the exact times for taking the medications. This should also include the rationale for doing so. That is, to avoid over- or under-medicating themselves.

3.3 Complications

Non-compliance due to poor literacy result in some patients experiencing complications. Most of the patients experiencing complications do not know that they are linked to the disease process and non-adherence. Patients who were not compliant experienced complications compared to those who are compliant [26]. Some of the complications experienced by diabetes mellitus patients on prescribed medications are listed on (Table 2). For erectile dysfunction, women were excluded.

4. Need versus no need for assistance with adherence to medications

Most of the diabetes mellitus patients are not aware that they are not taking medications correctly. This is because patients believe they are complying with how professional nurses have told them. On the other hand, other patients think they still need further assistance on how to adhere to medications. Misunderstanding of medication instructions could be reduced through improving clarification and understanding of labeling on prescribed medications by medication dispensers [20]. That is the reason patients believe the information given to them by health professionals as they trust that they are experts in their fields. It is, therefore, health professionals’ duty to fully equip themselves with the knowledge needed for patients to understand the medications instructions. This knowledge should be made clearer to the level of patients understanding.

Participant ‘T’ indicated that they need assistance and said, “I feel I need assistance on how I should eat and take medication correctly. I do not have such knowledge, I need it”.

On the contrary, **participant ‘V’** said, “According to me I do not need it because every time when I collect medications here at the clinic, they teach us how we should consume them”. **Yet participant ‘U’** also said, “No, I do not need it. I see myself taking the medications correctly, I am satisfied”.

5. The importance of health literacy on disease management

Health literacy is essential for effective access to care, self-care of chronic conditions, and maintenance of health and wellness. It is also essential to healthcare, necessitating individuals to have a more active role in decision making and disease management [27]. Health literacy enables patients to accurately interpret the medication instructions to ensure proper and safe use. It is therefore linked to medication adherence and consequently contribute towards persevering life.

6. Interpretation of the medication instructions

Understanding medication instructions coupled with other treatment measures like lifestyle modification, play a major part in controlling diabetes mellitus. The instructions need to be clear such that patients will not take their medications incorrectly as a result of misunderstanding. It is important for medication dispensers to make sure that patients understand the correct meaning of these instructions before they leave the facilities. Health literacy should therefore be imparted to enhance medication instructions comprehension and medication compliance in diabetes mellitus patients [1]. **Table 3** give an outline of the prescribed medication instructions’ explanation as a recommendation to assist people with cardiovascular diseases on treatment.

Area	If on your medication it is written	It means
Before or after	Before food or meal	Take your medication, then you can have your food immediately or 30 minutes before food
	After food or meals	Eat your food first then after that you can take your medication.
Daily	Take 1 tablet daily	Since a day has 24 hours; therefore, divide 24 hours by 1 = 24. So, you are going to take your medication at the same time every day. E.g., if you choose 07 h00 am, that should be your everyday time.
At night	Take 1 tablet at night	It is the same as above, but you choose a night -time. E.g., 19 h00.
In the morning	Take 1 tablet mane or in the morning.	Same as the above but you choose a morning time. Any time before 12 h00 noon. E.g., 07 h00 am.
2x a day	Take 1 tablet two times a day (BD).	You divide 24 hours by 2 = 12 hours. For every 12 hours you should take your medication. E.g., if you choose 07 h00 in the morning, the next 12 hours will be at 19 h00 in the evening
3x a day	Take 1 tablet three times a day (TDS).	You divide 24 hours by 3 = 08 hours. For every 08 hours you need to take your medication. E.g., if you take the first dose/pill at 06 h00 am, 14 h00, & 22 h00.
4x a day	Take 1 tablet 4 times a day.	You divide 24 hours by four = 06 hours. For every 06 hours you need to take your medication. i.e., 06 h00, 12 h00 pm, 18 h00 & 00 h00 am.

Table 3.
An outline of the prescribed medication instructions’ explanation.

7. Conclusions

Health literacy regarding prescribed medication instructions if important to diabetes mellitus and people with cardiovascular diseases at large. Understanding prescribed medications instructions by diabetes mellitus patients could assist in alleviating some of the complications experienced by some of the patients living with this disease.

Conflict of interest

The authors declare no conflict of interest.

A. Appendices

Appendix 1 provide take home information for diabetes mellitus patients as reference guides.

1. What is Diabetes?

Diabetes mellitus is a group of diseases that affect the way the body uses blood sugar called glucose (Castro, 2020).

It also known as sugar diabetes; it is a disease whereby the body cells are unable to utilise the sugar in the blood for body functioning. It has two types; Type 1 which can develop anytime during childhood or adolescence, and Type 2 which is commonly associated with aging, mostly develop in people 40 years and above (Castro, 2020).

2. Common Symptoms

Common Symptoms are: Increased thirst, Frequent urination, Extreme hunger, Unexplained weight loss, Fatigue, Irritability, Blurred vision, Slow-healing sores, Frequent infections and Vaginal infections in women (Castro, 2020)

3. Causes or Risk Factors

There is no known cause of diabetes, however, the following factors may increase the risk for type 1 diabetes:

- ☐ Family history.
- ☐ Environmental factors.
- ☐ The presence of damaging immune system cells (autoantibodies).
- ☐ Geography/ Location.

Type 2 – factors increasing the risk include:

- ☐ Weight, inactivity.
- ☐ Family history, Race, Age.
- ☐ Gestational diabetes.
- ☐ Polycystic ovary syndrome.
- ☐ High blood pressure.
- ☐ Abnormal cholesterol and triglyceride levels.

5. Disease Process and Complications

As the disease progresses it causes damage to some organs in the body resulting in the following complications:

- ☐ Cardiovascular diseases (e.g., stroke, heart attack, chest pains, narrow arteries).
- ☐ Nerve damage (Neuropathy) signs – tingling sensation, numbness, burning or pain that usually starts at the tips of the toes or fingers and slowly spreads upward.
- ☐ Kidney damage (Nephropathy) – kidney failure.
- ☐ Eye damage (Retinopathy) – Blindness, glaucoma, cataracts.
- ☐ Foot damage – may lead to leg amputations.
- ☐ Skin conditions – Fungal and bacterial infections.
- ☐ Hearing impairment – is more common.
- ☐ Depression (Castro, 2020).

9. Diabetes Mellitus Treatment

Types of Diabetes Medications

The medication is divided into oral (pills) and injectables (insulin injections).

Lifestyle Modification

A diabetic patient should follow a healthy eating pattern, be physically active and manage stress.

- ☐ Diabetes patients should be committed to manage their diabetes.
- ☐ You need to choose healthy foods and maintain healthy weight – a mere lost in body weight makes a difference.
- ☐ Make sure that physical activity becomes part of your daily routine.
- ☐ Identify yourself by wearing a bracelet.
- ☐ Have a yearly schedule for physical and regular eye examination.
- ☐ Always pay attention to the feet.
- ☐ Keep blood pressure and cholesterol under control.
- ☐ Take care of the teeth.
- ☐ Limit alcohol intake.
- ☐ Take stress seriously – learn stress managing techniques that work for you (Castro, 2020).

Benefits of Physical Activity

- ☐ It lowers blood glucose levels.
- ☐ It lowers blood pressure.
- ☐ It improves blood flow.
- ☐ It burns extra calories so you can keep your weight down if needed.
- ☐ It enhances your mood.
- ☐ It can prevent falls and improve memory in older adults, and
- ☐ It can help you sleep better (NIDDK, 2020).
- ☐ It lowers blood sugar level by moving sugar into the cells, and
- ☐ It increases sensitivity to insulin (Castro, 2020).

Diet

Goals for diet

- ☐ To prevent wide fluctuations in blood sugar levels throughout the day.
- ☐ To restore blood sugar and lipid levels to normal.

Principles of diet

Eat a balanced diet throughout the day

- ☐ Eat three times per day
- ☐ Eat consistent amount of carbohydrates and calories at different mealtime
- ☐ Take a snack between meals to prevent insulin reaction/being hungry (Segal, Robinson & Smith, 2019).

Carbohydrates

- ☐ Eat mostly complex starches (papa, pasta, rice, brown bread etc)
- ☐ Should occupy half part of a medium plate or a cup size (Segal, Robinson & Smith, 2019).

Protein

- ☐ Substitute animal protein with vegetable one
- ☐ Eat soy beans, nuts, pumpkin seeds, etc
- ☐ Should occupy half quarter of the plate (Segal, Robinson & Smith, 2019).

Fat

- ☐ Reduce fat intake because fat interferes with insulin absorption.
- ☐ Use low fat milk or fat free, lite margarine, small amount of low cholesterol oil for cooking, eat lean meat, discard chicken skin, take out excess fat in meat, avoid deep frying.
- ☐ Should occupy about a quarter of the plate
- ☐ Avoid fast foods and processed meats (Segal, Robinson & Smith, 2019).

Fibre

- ☐ Eat mostly soluble fibre because it lowers blood sugar
- ☐ Eat whole fruit rather than 100% juice, and eat apple with its skin (Segal, Robinson & Smith, 2019).

4. Diabetes Danger Signs

Many factors can affect your blood sugar; the following problems may arise and require instant care:

- ☐ High blood sugar (hyperglycaemia).
- ☐ Increased ketones in urine (diabetic ketoacidosis).
- ☐ Hyperglycaemic hyperosmolar nonketotic syndrome.
- ☐ Low blood sugar (hypoglycaemia).

6. Prevention

- ☐ Eat healthy foods.
- ☐ Get more physical activity.
- ☐ Lose excess weight.

7. Other diseases (Comorbidities) co-existing with Diabetes mellitus

Hypertension, hyperlipidaemia, chronic heart diseases, chronic kidney disease, asthma, epilepsy, cancer, arthritis, peripheral vascular disease, osteoporosis, depression, chronic obstructive pulmonary diseases, HIV/AIDS and obesity (Nowakowska, 2018)

9. Interpretation of Diabetes Mellitus Medication Instructions

For diabetes patients to adhere to medication instructions, the instructions should be illustrated in a simple way. Most of the diabetic medications are taken daily, twice or thrice a day. However, all the possible instructions will be explained in this programme

Area	If on your medication it is written	It means
Before or after	Before food or meal	Take your medication, then you can have your food immediately or 30 minutes before food
	After food or meals	Eat your food first then after that you can take your medication.
Daily	Take 1 tablet daily	Since a day has 24 hours; therefore, divide 24 hours by 3 = 24, 30, you are going to take your medication at the same time every day. E.g., if you choose 0700 am, that should be your time daily.
At night	Take 1 tablet at night	It is the same as above, but you choose a night-time. E.g., 1900.
In the morning	Take 1 tablet more or in the morning.	Same as the above but you choose a morning time. Any time before 1200 hours. E.g., 0700 am.
2x a day	Take 1 tablet two times a day (BID)	You divide 24 hours by 2 = 12 hours. For every 12 hours you should take your medication. E.g., if you choose 0700 in the morning, the next 12 hours will be at 1900 in the evening
3x a day	Take 1 tablet three times a day (TID)	You divide 24 hours by 3 = 08 hours. For every 08 hours you need to take your medication. E.g., if you take the first dose/pill at 0900 am, 1400, & 2200.
4x a day	Take 1 tablet 4 times a day	You divide 24 hours by four = 06 hours. For every 06 hours you need to take your medication. I.e., 0600, 1200 pm, 1800 & 0000 am.

10. Insulin Injection sites

Insulin is injected into the fat layer under the skin (Morris, 2017). The figure above shows the insulin injection sites.

Note that

Have an alarm in your phone with all the times recorded for you to take your medication. Have a snack and water next to your bed to avoid non-adherence. E.g. you can have an apple, slice of bread, a banana etc. as a snack.

10

B. Appendix 1

Improving health literacy on diabetes mellitus.

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