

## Knowledge and Practices Regarding Exercise In Type 2 Diabetic Patients Aged 20-69 Years

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**Abstract:** Diabetes decreases life expectancy and increases mortality rate and morbidity associated with development of complications with enormous cost. It is the fourth leading cause of death worldwide. Diabetes decreases life expectancy and increases mortality rate and morbidity associated with development of complications with enormous cost. However, with proper diet, exercise and good adherence to medication (three cornerstones of management), diabetes can be managed with minimal or no complications. This descriptive cross-sectional study was conducted at Parirenyatwa group of Hospital in Harare, Zimbabwe and it was done in the out-patients' department. A random sample of 84 adults with a diagnosis of type II diabetes was recruited. Study approval was granted by the Joint Research and Ethics Committee. All participants gave informed consent and all interviews were held in a private room. Code numbers were used to identify participants and filled in questionnaires were kept in a lockable cupboard to which the researcher and research assistant had sole access. Data was collected through researcher administered questionnaires. Though majority participants knew that exercise controls blood sugar (100%), 82% and 84% knew walking and running as types of exercise respectively, and 94% knew that one should have a medic alert bracelet all the time only 3.6% knew that the physical exercise should be structured and only 6% knew that one should exercise for more than 30 minutes per session. The younger age group (20-49) had better knowledge of exercise ( $p=0.002$ ) while women had better knowledge than men ( $p=0.029$ ). In terms of practice 94% had not engaged in vigorous activity over the past week, only 1.2% had spent more than 2.5 hours doing moderate activity while majority 65.5% had only walked for less than 10 minutes over the past week. Majority 56% had poor practice of exercise. The younger age group (20-49) had better practice of exercise than their older counterparts ( $p=0.016$ ) while rural dwellers had better practice of exercise than their urban counterparts ( $p=0.00014$ ). There is need to incorporate health education on exercise in patients with type II diabetes. Physiotherapists must be involved in the care of people with diabetes.

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### I. Introduction

Diabetes mellitus is the fifth among ten most common diseases in Zimbabwe and its prevalence has risen by 87% from the previous decades.<sup>1</sup> Globally diabetes cases rose from 366 million in 2011 to 522 million in 2030 and are projected to rise from 382 million in 2013 to 592 million by 2035.<sup>2</sup> It is the fourth leading cause of death worldwide.<sup>3</sup> Diabetes decreases life expectancy and increases mortality rate and morbidity associated with development of complications with enormous cost.<sup>4</sup> However, with proper diet, exercise and good adherence to medication (three cornerstones of management), diabetes can be managed with minimal or no complications.<sup>5</sup> Diet and exercise improves blood glucose levels by increasing insulin sensitivity thus improving cardiovascular function.<sup>6</sup> Physical exercise includes all movements of the body that increases utilization and uptake of glucose as a fuel.<sup>7</sup> Long-term benefits include reduction of visceral fat mass and body weight without decreasing muscle mass, increased insulin sensitivity, glucose and blood pressure control, and reduced the cardiovascular diseases risk.<sup>7</sup> Though physical exercise should be tailored to meet the specific needs of each individual, it is generally recommended that an individual has at least 150 min/week of physical activity and dietary changes resulting in weight loss of 5%–7% are recommended, without allowing more than 2 consecutive days of no exercise.<sup>8</sup>

According to records at the study site most patients admitted with diabetes have poorly controlled blood glucose while informal interviews revealed that patients did not engage in physical exercise and other lifestyle modification strategies. Findings from a study conducted at the same site also revealed that 80% participants had had at least one complication of diabetes including retinopathy (28,4%), hypertension, nephropathy (44,8%), cardiovascular diseases and diabetic foot among others.<sup>9</sup> Globally more than 50% T2D patients are hypertensive and more than 30% are obese (Colosia et al.,2014). Diabetes will be the leading cause of death in 2030, but its consequences can be greatly avoided with physical activity or exercise.<sup>2</sup>

Sedentary lifestyle is a major driver of rising burden of type II diabetes in Sub-Saharan Africa, Zimbabwe included, together with scarcity of resources and lack of a multi-sector approach in the management of diabetes.<sup>10</sup> Less attention has been given regarding the knowledge and practices regarding exercise (Awotidebe, Adedoyin, Afolabi&Opiyo, 2016). No exercise guidelines for diabetic patients have been developed in Zimbabwe. This is a major gap in management as requirements for physical activity differ according to race and type of diabetes among other things.<sup>11</sup>The purpose of the study, therefore, was to determine knowledge and practice of physical activity of adults with type II diabetes at Parirenyatwa Group of hospitals (PGH) medical wards.

## II. Material and Methods

**Study Design:** Descriptive cross-sectional design

**Study Location:** The study was conducted at Parirenyatwa Group of Hospital out-patients’ department, which is a quaternary care centre in Harare, Zimbabwe

**Study Duration:** March 2018 to April 2018

**Sample size:** 84 patients.

**Sample size calculation:** The sample size was calculated using the Dobson formula assuming a prevalence of 5.7% of diabetes in Zimbabwe, confidence interval of 95% and 80% power.

**Participants& selection method:** A random sample of 84 participants was drawn from the diabetic clinic in the out-patients’ department of the hospital.

### Inclusion criteria:

1. Aged between 18 and 69 years
2. Having a diagnosis of type II diagnosis
3. Having been diagnosed at least for more than 1 year

### Exclusion criteria:

1. Pregnant diabetic patients
2. Critically ill diabetic patients
3. Mentally challenged diabetic patients
4. Institutionalized diabetic patients
5. Diabetic patients with a physical disability

### Procedure methodology

Permission to conduct the study was granted by the Joint Research Ethics Committee of the University of Zimbabwe College of Health Sciences and Parirenyatwa Group of Hospitals, sisters in charge, heads of departments and consultants of respective medical wards. All participants gave informed consent. All interviews were conducted in a private room and no identifying information appeared on filled in questionnaires which were kept in a lockable cupboard to which the researcher had sole access. Data was collected through face to face interviews using a structured questionnaire which was divided into “Demographic,” “Knowledge” and “Practice” sections. Practice of physical activity was measured using the International Physical Activity Questionnaire (IPAQ) short version.

### Statistical analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 22 and descriptive statistics (frequencies and means) and chi square test (differences in proportions) were used to interpret the data.

## III. Result

This section presents results of the study.

**Table 1** presents demographic data.

**Table 1** Demographic Data (n=84)

| Variables n=84 |         | Frequency | Percentage |
|----------------|---------|-----------|------------|
| Gender         | Males   | 30        | 35.7       |
|                | Females | 54        | 64.3       |
| Age            | 20-29   | 1         | 1.2        |
|                | 30-39   | 8         | 9.5        |
|                | 40-49   | 38        | 45.2       |

|                    |                   |    |      |
|--------------------|-------------------|----|------|
|                    | 50-69             | 37 | 44.0 |
| Marital status     | Married           | 58 | 69.0 |
|                    | Divorced          | 7  | 8.3  |
|                    | Single            | 3  | 3.6  |
|                    | widow             | 16 | 19.0 |
| Religion           | Christian         | 78 | 92.9 |
|                    | African tradition | 6  | 7.1  |
|                    | Moslem            | 0  | 0    |
| Level of education | No education      | 6  | 7.1  |
|                    | Primary education | 15 | 17.9 |
|                    | Ordinary level    | 43 | 51.2 |
|                    | Advanced level    | 10 | 11.9 |
|                    | Tertiary          | 10 | 11.9 |
| Employment status  | Employed          | 35 | 41.7 |
|                    | Self employed     | 24 | 28.6 |
|                    | Unemployed        | 24 | 28.6 |
|                    | Casual worker     | 1  | 1.2  |
| Monthly income(\$) | 0-250             | 34 | 40.5 |
|                    | 251-500           | 36 | 42.9 |
|                    | 501-1000          | 14 | 16.7 |
|                    | Above 1000        | 0  | 0    |
| Residential area   | Urban             | 52 | 61.9 |
|                    | Rural             | 30 | 35.7 |
|                    | Farm              | 2  | 2.4  |

Knowledge of Exercise

**Table no2** presents knowledge of exercise

**Table no2** Knowledge of Exercise (n=84)

| Variable   | Frequency | Percentage |
|--|-----------|------------|
| 1. What is exercise?   |           |            |
| a) Any body activity   | 81        | 96.4       |
| b) Structured activity of body   | 3         | 3.6        |
| 2. How many days per week should an individual exercise?                           |           |            |
| a) Less than 3 days  | 7         | 8.3        |
| b) 3 to 5 days   | 77        | 91.7       |
| 3. How many minutes should an individual exercise per day                          |           |            |
| a) Less than 30 minutes  | 79        | 94.0       |
| b) 30-60 minutes   | 5         | 6.0        |
| 4. What are the benefits of exercise   |           |            |
| a) Controls blood sugar  | 84        | 100.0      |
| b) Increases insulin sensitivity   | 13        | 15.5       |
| c) Reduces need of medication  | 17        | 20.2       |
| d) Improves quality of life  | 22        | 26.2       |
| e) Keeps the body fit  | 25        | 29.8       |
| f) Decreases episodes of hospitalisation   | 30        | 35.7       |
| g) Can control blood sugar without medication                                      | 15        | 17.9       |
| h) Reduces stress  | 23        | 27.4       |
| i) Prevents complications  | 21        | 25.0       |
| 5. What should be done before and after exercise?                                  |           |            |
| a. Test blood sugar  | 30        | 35.7       |
| b. Eat   | 60        | 71.4       |
| c. Examine feet  | 10        | 11.9       |
| 6. What should be done for easy identification in case of trouble during exercise? |           |            |
| a. Have an identifying bracelet all the time                                       | 79        | 94.0       |
| b. Exercise with someone   | 5         | 6.0        |
| 7. What types of exercises do you know?  |           |            |
| a. Walking   | 82        | 97.6       |
| b. Running   | 84        | 100.0      |
| c. Cycling   | 14        | 16.7       |
| d. Digging   | 37        | 44.0       |
| e. Climbing  | 18        | 21.4       |
| f. Jogging   | 36        | 42.9       |
| g. Swimming  | 6         | 7.1        |
| h. Weight lifting  | 10        | 11.9       |

Practice Regarding Exercise (IPAQ)

Table no 3 presents practice regarding exercise.

**Table no 3** Practice regarding exercise (n=84)

| Variable   | Frequency | Percentage |
|--|-----------|------------|
| 1. During the last 7 days, on how many days did you do vigorous activity (days per week)   | 79        | 94.0       |
| i. None  | 4         | 4.8        |
| ii. Less than 3  | 1         | 1.2        |
| iii. 3 or more   |           |            |
| 2. a) How many minutes per day did you do vigorous activity  | 3         | 3.6        |
| i. Less than 30 minutes  | 2         | 2.4        |
| ii. 30-60 minutes  |           |            |
| 2. b) How much time in total would you spend over the last 7 days doing vigorous physical activity (hours/week)                    | 2         | 2.4        |
| i. Less than 1   | 2         | 2.4        |
| ii. 1-2.5 (150 min)  | 1         | 1.2        |
| iii. More than 2.5   |           |            |
| 3. During the last 7 days on how many days did you do moderate physical activity (days/week)                                       | 58        | 69.0       |
| i. None  | 15        | 17.9       |
| ii. Less than 3  | 11        | 13.1       |
| iii. 3 or more   |           |            |
| 4. a) How much time did you usually spend doing moderate physical activities on one of those days(minutes/day)                     | 5         | 6.0        |
| i. Less than 30 min  | 21        | 25.0       |
| ii. 30 -60 min   |           |            |
| 4. b) What is the total amount of time you spent over the last 7 days doing moderate physical activities? (hours/week)             | 1         | 1.2        |
| i. Less than 1 hr.   | 19        | 22.6       |
| ii. 1-2.5(150 min)   | 6         | 7.1        |
| iii. More than 2.5 hrs.  |           |            |
| 5. During the last 7 days, on how many days did you walk for at least 10 minutes a (days/week)                                     | 0         | 0          |
| i. None  | 55        | 65.5       |
| ii. Less than 3  | 29        | 34.5       |
| iii. More than 3   |           |            |
| 6 a) How much time did you usually spend walking on one of those days(minutes/day)   |           |            |
| i. Less than 30 min  |           |            |
| ii. 30-60 min  |           |            |
| 6 b) What is the total amount of time you spent walking over the last 7 days? (hours /week)  | 60        | 71.4       |
| i. Less than 1 hr.   | 24        | 28.6       |
| ii. 1-2.5 (150 min)  |           |            |
| iii. More than 2.5 hr.   |           |            |
| 7 a) During the last 7 days, how much time did you usually spent sitting on a weekday (hours per weekday)                          | 40        |            |
| i. Less than 5 hours   | 30        | 47.6       |
| ii. 5- 10 hrs.   | 14        | 35.7       |
| iii. More than 10hrs   |           | 16.7       |
| 7 b) What is the total amount of time you spent sitting last Wednesday? Average time per day spent sitting is being sought (hours) | 10        |            |
| i. Less than 5 hrs.  | 20        |            |
| ii. 5-10 hrs.  | 54        |            |
| iii. More than 10hrs   |           | 11.9       |
| Total Scores on Practice   |           | 23.8       |
| Poor   |           | 64.3       |
| Moderate   |           |            |
| High   | 9         |            |
|  | 15        |            |
|  | 60        |            |
|  | 45        | 10.7       |
|  | 25        | 17.9       |
|  | 14        | 71.4       |

|  |  |      |
|--|--|------|
|  |  | 53.6 |
|  |  | 29.8 |
|  |  | 16.6 |

Table no 4 presents difference in knowledge levels by demographic variables.

**Table no 4** Demographic variables and knowledge levels (n=84)

| Demographic variable  | KNOWLEDGE       |                  |                       | P value       |
|-----------------------|-----------------|------------------|-----------------------|---------------|
|                       | Poor<br>Freq(%) | Good<br>Freq( %) | Very good<br>Freq( %) |               |
| <b>Age</b>            |                 |                  |                       | <b>0.002</b>  |
| 20-49                 | 2(5.3)          | 23 (90.2)        | 22 (62.4)             |               |
| 50-69                 | 12 (32.4)       | 16 (43.2)        | 9 (24.3)              |               |
| <b>Sex</b>            |                 |                  |                       | <b>0.029</b>  |
| Male                  | 9(29.8)         | 14(47.6)         | 7(22.6)               |               |
| Female                | 5(9.3)          | 25 (46.3)        | 24 (44.4)             |               |
| <b>Religion</b>       |                 |                  |                       | 0.404         |
| Christian             | 12(15.4)        | 36(42.6)         | 30(38.5)              |               |
| ATR                   | 2(33.3)         | 3(50.0)          | 1 (16.7)              |               |
| <b>Marital status</b> |                 |                  |                       | 0.177         |
| Married               | 11(19.0)        | 22 (37.9)        | 25 (37.9)             |               |
| Divorced              | 2(28.6)         | 2 (28.6)         | 3 (42.9)              |               |
| Single                | 8(50.0)         | 8 (37.5)         | 3 (33.3)              |               |
| <b>LOE</b>            |                 |                  |                       | <b>0.016</b>  |
| No education          | 4 (66.6)        | 2 (33.3)         | 1(3.6)                |               |
| Education             | 10 (7.0)        | 37 (55.8)        | 30 (80.0)             |               |
| <b>Employment</b>     |                 |                  |                       | <b>0.027</b>  |
| Employed              | 3(8.6)          | 20 (57.1)        | 12 (34.3)             |               |
| S/employed            | 2(8.3)          | 12 (50.0)        | 10 (41.7)             |               |
| Unemployed            | 9 (37.6)        | 6 (25.0)         | 9 (37.6)              |               |
| <b>Income</b>         |                 |                  |                       | <b>0.019</b>  |
| 0-250                 | 10 (29.4)       | 18 (52.9)        | 6 (17.6)              |               |
| 251-500               | 3 (8.3)         | 15 (41.7)        | 18 (50.0)             |               |
| 501-1000              | 1 (7.1)         | 6 (42.9)         | 7 (50.0)              |               |
| <b>Residence</b>      |                 |                  |                       | <b>0.0003</b> |
| Urban                 | 3 (5.8)         | 23 (44.2)        | 26 (50.0)             |               |
| Rural                 | 11 (50.0)       | 16 (50.0)        | 5 (16.7)              |               |

Table no 5 presents difference in practice of exercise by demographic variables.

**Table no 5** Demographic variables and practice of exercise(n=84)

| Demographic variable  | Level of practice |                |                     | P value       |
|-----------------------|-------------------|----------------|---------------------|---------------|
|                       | Poor<br>Freq %    | Good<br>Freq % | Very good<br>Freq % |               |
| <b>Age</b>            |                   |                |                     | <b>0.016</b>  |
| 20-49                 | 17 (34.2)         | 17 (34.2)      | 13 (31.6)           |               |
| 50-69                 | 28 (75.7)         | 8 (21.7)       | 1(2.7)              |               |
| <b>Sex</b>            |                   |                |                     | 0.630         |
| Male                  | 14 (47.6)         | 10 (33.3)      | 6(20.0)             |               |
| Female                | 31 (57.4)         | 15 (27.8)      | 8 (14.8)            |               |
| <b>Religion</b>       |                   |                |                     | 0.979         |
| Christian             | 42(53.8)          | 23 (29.5)      | 13 (16.7)           |               |
| ATR                   | 3 (50.0)          | 2 (33.3)       | 1 (16.7)            |               |
| <b>Marital status</b> |                   |                |                     | 0.307         |
| Married               | 28 (48.3)         | 19 (32.8)      | 11(19.0)            |               |
| Divorced              | 3 (42.9)          | 2 (28.6)       | 2(28.6)             |               |
| Single                | 14(81.3)          | 4 (18.8)       | 1(33.3)             |               |
| <b>LOE</b>            |                   |                |                     | 0.785         |
| No education          | 2 (33.3)          | 3 (50.0)       | 1 (16.7)            |               |
| Education             | 43 (60.0)         | 22 (30.0)      | 13 (18.6)           |               |
| <b>Employment</b>     |                   |                |                     | 0.275         |
| Employed              | 22 (62.9)         | 10 (28.6)      | 13 (37.1)           |               |
| S/ employed           | 10 (41.7)         | 6 (25.0)       | 8 (33.3)            |               |
| Unemployed            | 13 (54.2)         | 9 (33.3)       | 3 (12.5)            |               |
| <b>Residence</b>      |                   |                |                     | <b>0.0001</b> |
| Urban                 | 37 (71.2)         | 13 (25.0)      | 2 (3.8)             |               |
| Rural                 | 8 (26.7)          | 12 (40.0)      | 10 (33.3)           |               |

#### **IV. Discussion**

##### **Demographic data**

The study was conducted with 84 adults with type II diabetes. Majority (64.3%) were females. Women in SSA have greater risk factor burden for T2D than men, in particular obesity, which is explained in part by sociocultural factors.<sup>12</sup> Women are generally more likely to report to a health care institution with medical problems than their male counterparts. Majority participants were in the 40-59 age group. This according to Peer et al. (2014) forms the largest population of adults with diabetes.<sup>13</sup>

Majority of participants in the study had reached the ordinary level of education and were likely able to read, write and internalize information. High literacy enhances comprehension of both written and oral instruction.<sup>14</sup> In turn an association between knowledge and good self-care practice has been widely reported in literature. The high literacy in the sample studies is a perfect opportunity for effective health education on exercise and good self-care practice in people with type II diabetes. Similarly, findings of this study revealed that a significantly larger proportion of participants who had had some formal education had very good knowledge of physical activity (80.0% vs 3.6%,  $p < 0.016$ ). Though most people might not afford gyms and exercise equipment, exercise is quite cheap and simple to execute without necessarily paying for gyms or buying exercise equipment. It is important to promote customized and culturally appropriate health education regarding exercise in view of its immense benefits in type II diabetes.

Majority participants resided in Harare which is an urban setting. Residing in an urban setting has been associated with a sedentary lifestyle and consumption of refined foods. Similarly, findings of this study revealed that a significantly larger proportion of participants who resided in an urban area reported poor exercise practice (71.2% vs 26.7%,  $p < 0.00014$ ). It is very crucial to promote safe exercise in urban dwellers to improve glycaemic control and minimize complications. Lack of gyms and unsafe environment for physical exercise have been reported as barriers to exercise in women with diabetes.<sup>15</sup>

##### **Knowledge Regarding Exercise**

All participants were aware of exercise in type II diabetes and majority, (46.4%) participants had knowledge of exercise. This can be attributed to health education sessions given every week in the diabetic clinic at Parirenyatwa hospital. Moderate knowledge of exercise in type II diabetes has also been reported in literature.<sup>14, 16-18</sup> However, a study conducted earlier in 2014 in Zimbabwe reported lack of knowledge of exercise in type II diabetes.<sup>19</sup>

A significantly larger proportion of younger participants aged 20-49 years had very good knowledge of physical activity compared to their older counterparts in the 50-69 years' category (62.4% vs 24.3%,  $p < 0.0016$ ). This could be attributed to access to information through internet or media in the younger generation. Regarding gender more females had very good knowledge of physical activity (44.4% vs 22.6%,  $p < 0.029$ ). Another significantly larger proportion of participants who were either self-employed or employed had good knowledge (76.0% vs 37.6%,  $p < 0.027$ ) while more urban dwellers (50.0% vs 16.7%,  $p < 0.0003$ ) had very good knowledge of physical activity. The urban population also has more access to information than their rural counterparts. However, in this study the good knowledge did not translate to good exercise practice.

Despite high awareness of exercise in the sample, only 3.6% knew that it should be planned and structured. This reflects a gap in practice and reflects inadequate health education that is not individualized. Individualized care is important in management of diabetes in view of its multifaceted nature.<sup>15</sup> Patients are aware of importance of exercise but lack detailed knowledge about type, duration, timing and frequency.<sup>20</sup> This was demonstrated in this study were only 13%, 21.4% and 21% knew the benefits of exercise, knew that exercise increases insulin sensitivity and knew that exercise prevents complications respectively. Knowledge of these details about exercise in diabetes is likely to motivate an individual to engage in exercise. One study conducted in South Africa reported poor knowledge of benefits of exercise.<sup>21</sup>

##### **Practice Regarding Exercise**

Practice of physical activity was measured using the short version of the International Physical Activity Questionnaire (IPAQ). Over half (53.6%) participants reported poor practice of exercise. However poor practice regarding exercise has often been reported in literature. Keakile, (2015) reported 90.0% proportion of participants who either did not engage in physical activity or reported low levels of physical activity.<sup>16</sup> A study in Pretoria by Okonta, (2014) reported 97.7% bad practice of lifestyle modifications including exercise in diabetes.<sup>21</sup> According to Mukeshimana et al., (2015), many people are likely not to practice because they do not have the knowledge regarding the exercise. According to Halal et al., (2012) only 31.3% of adults globally are physically active.<sup>22</sup>

However, significantly more participants in the age group 50-69 years than in the age group 20-49 years had poor physical activity practices (31.6% vs 2.7%,  $p < 0.016$ ). This could be due to age related health

problems such as swelling of feet, poor vision and other comorbidities. This underscores the importance of individualized health education that is effective at individual level.

Despite knowledge being moderate in this study, practice of exercise was generally poor. A study conducted by Herath et al. (2017) also reported similar results.<sup>23</sup> Another study reported by Ranasinghe et al. (2015) also reported poor adherence to exercise despite good knowledge. Some reasons for that could be lack of time, comorbidities, lack of social support and unsafe neighborhoods.<sup>15</sup> Findings of this study indicate that knowledge of physical exercise along is not adequate to motivate an individual to engage. There is need for individual assessment of patients so that care is customized according to individual needs. Physiotherapists and dieticians should be actively involved in care. Adherence to medication should be done routinely to ensure that optimum glycaemic control is achieved.

## V. Conclusion

Knowledge of exercise was moderate among adults with type 2 diabetes while practice was generally poor. More participants in the younger age groups had very good knowledge of exercise compared to their older counterparts. More rural dwellers had very good practice of exercise compared to their urban counterparts.

## References

- [1] Mufunda E, Wikby K, Björn A, Hjelm K. Level and determinants of diabetes knowledge in patients with diabetes in Zimbabwe: a cross-sectional study. *The Pan African Medical Journal*. 2012;13.
- [2] Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes research and clinical practice*. 2014;103(2):137-49.
- [3] Baraz S, Shahbazian HB, Miladinia M, Zarea K. Video training programs and the quality of life of patients with type II diabetes. *Jundishapur Journal of Chronic Disease Care*. 2015;4(4).
- [4] Crews RT, Schneider KL, Yalla SV, Reeves ND, Vileikyte L. Physiological and psychological challenges of increasing physical activity and exercise in patients at risk of diabetic foot ulcers: a critical review. *Diabetes/metabolism research and reviews*. 2016;32(8):791-804.
- [5] American Diabetes Association. Diagnosis and Classification of diabetes Mellitus. *Diabetes Care*. 2014;37(S1):81-90.
- [6] Fox CS, Golden SH, Anderson C, Bray GA, Burke LE, De Boer IH, et al. Update on prevention of cardiovascular disease in adults with type 2 diabetes mellitus in light of recent evidence: a scientific statement from the American Heart Association and the American Diabetes Association. *Circulation*. 2015;132(8):691-718.
- [7] Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes care*. 2016;39(11):2065-79.
- [8] Warburton DE, Bredin SS. Health benefits of physical activity: a systematic review of current systematic reviews. *Current opinion in cardiology*. 2017;32(5):541-56.
- [9] Machingura PI, Chikwasha V, Okwanga PN, Gomo E. Prevalence of and factors associated with nephropathy in diabetic patients attending an outpatient clinic in Harare, Zimbabwe. *The American journal of tropical medicine and hygiene*. 2017;96(2):477-82.
- [10] Mbanya JC, Assah FK, Saji J, Atanga EN. Obesity and type 2 diabetes in Sub-Saharan Africa. *Current diabetes reports*. 2014;14(7):501.
- [11] Padayachee C, Coombes J. Exercise guidelines for gestational diabetes mellitus. *World Journal of Diabetes*. 2015;6(8):1033-44.
- [12] Goedecke JH, Mtintsilana A, Dlamini SN, Kengne AP. Type 2 diabetes mellitus in African women. *Diabetes research and clinical practice*. 2017;123:87-96.
- [13] Peer N, Kengne A-P, Motala AA, Mbanya JC. Diabetes in the Africa region: 2013 update for the IDF diabetes Atlas. *Diabetes Res Clin Pr* doi: <http://dx.doi.org/101016/j.diabres>. 2013;6.
- [14] Al Bimani ZS, Khan SA, David P. Evaluation of T2DM related knowledge and practices of Omani patients. *Saudi Pharmaceutical Journal*. 2015;23(1):22-7.
- [15] Mukona D, Munjanja S, Zvinavashe M, Stray-Pederson B. Barriers of adherence and possible solutions to nonadherence to antidiabetic therapy in women with diabetes in pregnancy: patients' perspective. *Journal of diabetes research*. 2017;2017.
- [16] Keakile SB. Knowledge, attitudes and practices amongst diabetes mellitus patients about exercise at a primary health center in Gaborone Botswana: University of Limpopo; 2015.
- [17] Awotidebe TO, Adedoyin RA, Afolabi MA, Opiyo R. Knowledge, attitude and practice of exercise for plasma blood glucose control among patients with type-2 diabetes. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2016;10(2):S1-S6.
- [18] El-Amrawy F, Nounou MI. Are currently available wearable devices for activity tracking and heart rate monitoring accurate, precise, and medically beneficial? *Healthcare informatics research*. 2015;21(4):315-20.
- [19] Mandewo W, Dodge E, Chideme-Munodawafa A, Mandewo G. Non-Adherence To Treatment Among Diabetic Patients Attending Outpatients Clinic At Mutare Provincial Hospital, Manicaland Province, Zimbabwe. *International Journal of Scientific & Technology Research*. 2014;3(9):66-86.
- [20] Ranasinghe P, Piger A, Ishara M, Jayasekara L, Jayawardena R, Katulanda P. Knowledge and perceptions about diet and physical activity among Sri Lankan adults with diabetes mellitus: a qualitative study. *BMC public health*. 2015;15(1):1160.
- [21] Okonta HI, Ikomele JB, Ogunbanjo GA. Knowledge, attitude and practice regarding lifestyle modification in type 2 diabetic patients. *African journal of primary health care & family medicine*. 2014;6(1):1-6.
- [22] de Almeida Mendes M, da Silva ICM, Hallal PC, Tomasi E. Physical activity and perceived insecurity from crime in adults: a population-based study. *PloS one*. 2014;9(9):e108136.
- [23] Herath H, Herath R, Wickremasinghe R. Gestational diabetes mellitus and risk of type 2 diabetes 10 years after the index pregnancy in Sri Lankan women—A community based retrospective cohort study. *PloS one*. 2017;12(6):e0179647.

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