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Assessment of nutritional parameters and socioeconomic status among menopausal women with type II diabetes in Lagos Mainland, Lagos State, Nigeria

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ABSTRACT

Background and aim: Nutrition is a fundamental pillar of human life, health and development across the entire life span. The core elements of Anthropometric are height, weight, body mass index (BMI), body circumferences (waist, hip and limbs). These measurements are important because they represent diagnostic criteria for obesity, which significantly increases the risk for conditions such as T2DM and many more. Socioeconomic status (SES) is one of the critical factors determining menopausal age, a lower SES significantly associated with an elevated incidence of premature ovarian insufficiency and early menopause. Menopausal women with T2DM face unique nutritional challenges such as weight management, cardiovascular disease, mood and cognitive function that may significantly impact their health outcomes and quality of life. This study aims to assess the relationships between the Nutritional parameters and socioeconomic status among menopausal women with type II diabetes in Lagos mainland, Lagos state, Nigeria.

Methodology: Seven hundred and two (702) clinically diagnosed Type II diabetic menopausal women were recruited from some medical facilities at Lagos mainland. Nutritional parameters such as BMI, mid upper arm, waist, hip circumference among others were taken using standard procedures.

Results: The results shows that majority of the menopausal women with T2DM were overweight (270) and were diagnosed with Type II diabetes after Menopause. The average age at menopause was 46.73 years. There are statistically significant differences among the different nutritional classes in waist circumference (0.018), MUAC (0.004) and Thigh circumference (0.023) with p < 0.05. An Association exist between the menopause duration and nutritional status.

Conclusion: in conclusion, there is a relationship between the nutritional status, among menopausal women with type II diabetes in Lagos mainland, Lagos state Nigeria.

Keywords:

Nutrition; Type II diabetic women; Menopause

INTRODUCTION

Nutrition is a fundamental pillar of human life, health and development across the entire life span (FAO/WHO, 1992). From the earliest stages of fetal development, at birth, through infancy, childhood, adolescence, and into adulthood and old age, proper food and good nutrition are essential for survival, physical growth, mental development, performance and productivity, health and well-being (WHO, 2000). Anthropometric values are related to nutrition, genetic makeup, environmental characteristics, social and cultural conditions, lifestyle, functional status and health (Kyle et al., 2019). The core elements of anthropometry are height, weight, body mass index (BMI), body circumferences (waist, hip, and limbs), and skinfold thickness. These measurements are important because they This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

represent diagnostic criteria for obesity, which significantly increases the risk for conditions such as cardiovascular disease, hypertension, diabetes mellitus, and many more (Dimple *et al.*, 2018).

The mid-life is a vulnerable period for the development of obesity, longitudinal study has shown that this increase in weight is due to chronological aging rather than reproductive aging (Davis *et al.*, 2012) whereas changes in body composition and body fat distribution are related to both chronological and reproductive aging (Karvonen-Gutierrez *et al.*, 2016). Obesity is associated with differences in sex steroid trajectories during the menopausal transition; compared to women who are not obese, women with obesity have lower premenopausal oestrogen

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(Karvonen-Gutierrez et al., 2016). The changes in body fat distribution and elevated inflammatory cytokines (Malutan et al., 2014) that occur during the menopausal transition have been associated with decreased tissue insulin sensitivity and glucose tolerance (Vryonidou et al., 2015). The menopause is a life stage that all women experience, but the timing and symptoms can be different for everyone. It usually begins between the ages of 45 and 55. According to research reports, the average age is 51, for some women, it can occur earlier (Edwards, 2019). However, a variety of variables can either accelerate or delay the onset. Factors such as smoking, radiation exposure, chemotherapy, and removal of one or both ovaries can trigger early menopause, whereas overweight persons are likely to have menopause with adverse symptoms later in life (Faubion, et. al. 2015). The risk of occurrence of type 2 diabetes during menopause stage tends to increase as a result of decrease in estrogen levels were as life style modification can help reduce the risk (Lambrinoudaki et. al., 2022). Hormonal changes during perimenopause and menopause cause several characteristic symptoms (Santoro et al., 2021). The strength, frequency, and tolerability of the symptoms can also be influenced by lifestyle (Zhao et al, 2021). During menopause, hormone-sensitive breast cancer is more common in those whose menstruation started earlier than the average and ended later (Stankovic et al., 2024). Additional risk factors are if the woman has not given birth to a child or breastfed for at least 12 months (Xu et al., 2022). Studies have found that nutrition is important in controlling hormones (Domínguez-López et al., 2020). In perimenopausal or menopausal stage, it is important that an individual have a nutriton plan to help reduce those symptoms and maintain hormonal health (Rees, et al., 2022).

After menopause, the risk of acquiring Type II Diabetes is higher because a drop in estrogen makes it easier for bacteria and yeast to thrive in the urinary tract and vagina. After menopause, hot flashes and night sweats can keep one up at night. In turn, the sleep deprivation can make it tougher to manage blood sugar level. (Di Rosa *et al.*, 2023). Many studies have reported that lifestyle factors such as diet can influence the onset of natural menopause and the complications that accomplish it (Garczorz, *et al.*, 2024). Management of diabetes has been discussed for many years (Garczorz, *et al.*, 2024). Many diabetic menopausal women who are restricted access to affordable treatment, including insulin which is critical to their survival.

Since estrogen plays an important role in the normal sexual and reproductive development of women. The loss of estrogen can lead to menopausal changes and can have an impact on health and quality of life in the shorter term from menopausal symptoms (such as hot flushes and night sweats, sleep problems, muscle and joint pain, anxiety, depression, low libido) (Tanko *et al.*, 2019).

In menopausal women, metabolic flexibility diminishes due to estrogen reduction, and more fat accumulates in central depots (Ko & Jung, 2021) this study helps to assess the relationship between the nutritional and socioeconomic status of menopausal women with T2DM and will help target dietary behavior as a means of lowering the risk of disease in menopausal women, and also indicate the necessity to identify specific diet-related concerns, especially in T2DM Women (Adeniji, *et al.*, 2023). Although there are very few interventional studies focusing on menopausal women with T2DM, this study will help the health care system to create awareness and educate the women about menopause with emphasis on lifestyle assessment and counseling to counterbalance the negative effects of estrogen deficiency on general well-being and minimize the risk of T2DM. The research is aimed at assessing the Nutritional Parameters and Socioeconomic Status among Menopausal Women with Type II Diabetes in Lagos Mainland, Lagos State, Nigeria.

MATERIALS AND METHODS

Study population and location

The study involved 702 clinically diagnosed Type 2 Diabetes (T2DM) menopausal women aged from 40years and above in Lagos State, Nigeria. It was conducted in several Local Government Areas, including Mainland, Shomolu, Bariga, and Mushin, with data collected from the Lagos State University Teaching Hospital, various primary health centers, medical outreaches, and events like World Malaria and Diabetes Day.

Lagos Mainland, a key part of the Lagos Metropolitan Area, is a densely populated urban region connected to Lagos Island by major bridges, including the Third Mainland Bridge. It faces challenges such as poor sanitation, high rent, and youth criminal subculture (Uyieh, 2018). The area is predominantly inhabited by Yoruba ethnic groups, including the Ijebus, Egbas, Aworis, and Ilajes, alongside other Yoruba groups and significant populations from Nigeria's eastern and northern regions (National Bureau of Statistics, 2006).

Study design

A cross-sectional study was conducted among clinically diagnosed Type II diabetes menopausal women living in Lagos Mainland, Lagos State.

Sample size determination

The sample size for the study was determined using the sample formula by Nainag *et al.*, (2006)

$$n = \frac{Z^2 * p * q}{E^2}$$

Where: n represents the required sample size, Z is the Z-score corresponding to the desired confidence level. For a 95% confidence level, the Z-score is approximately 1.96. p is the estimated proportion of the population with the characteristic of interest. If there is no prior estimate, it is common to use 0.5 as a conservative estimate, which provides the maximum sample size. q is 1 - p, representing the proportion of the population without the characteristic of interest. E is the desired margin of error, indicating the acceptable amount of deviation from the true population parameter which is 5%.

384 was the minimum number of samples but the sample size of 702 hundred was used.

Sampling technique: A systematic random sampling technique was used to select the clinically diagnosed type II diabetic menopausal women who reside in the mainland. In each selected hospital in the locality, the sample size allotted to each metabolic clinic was divided among the selected hospitals in the mainland. the clinically diagnosed type II diabetes menopausal women were selected by systematic random sampling technique and the sampling interval was dependent on the total number of clinically diagnosed type II diabetes menopausal women with the proportion of the total sample allotted to it. Participants included in the study are menopausal women, who are mentally and physically fit, clinically diagnosed type II diabetes menopausal women who reside in the Lagos mainland. Women who gave their consent to participate in the research were present on the days, the study was conducted. Non-menopausal and non-diabetic women, menopausal women who are not residing in the mainland, and participants who did not give consent were excluded from the study. The study protocols were reviewed and approved by the Ahmadu Bello University, Zaria Research Ethics Board.

The sample size for the study was determined using the formula by Nainag *et al.* (2006):

$n = Z^2 \times p \times q / E^2$

Where:

- **n** is the required sample size,
- Z is the Z-score for the desired confidence level (1.96 for a 95% confidence level),
- **p** is the estimated proportion of the population with the characteristic of interest (commonly 0.5 as a conservative estimate for maximum sample size),
- **q** is 1 p (the proportion without the characteristic of interest),
- **E** is the desired margin of error (set at 5%).

n =
$$\frac{1.96^2 * 0.5 * 0.5}{0.05^2}$$
 = 384

Using this formula, the calculated minimum sample size was 384. However, a sample size of 702 participants was used for the study.

Sampling Technique

A systematic random sampling technique was employed to select clinically diagnosed Type II diabetic menopausal women in Lagos Mainland.

Inclusion Criteria

Participants included in the study were menopausal women who:

- Were clinically diagnosed with Type II diabetes,
- Resided in Lagos Mainland,
- Were mentally and physically fit,
- Provided informed consent, and
- Were present during the study days.

Exclusion Criteria

The study excluded:

- Non-menopausal and non-diabetic women,
- Menopausal women not residing in Lagos Mainland, and
- Women who declined to provide consent.

The study protocol was reviewed and approved by the Research Ethics Board of Ahmadu Bello University, Zaria.

Data collection

Data for this study was collected among the clinically diagnosed T2DM menopausal women who are in the Lagos mainland using a combination of self-administered and interviewer-administered questionnaires. The questionnaire was structured in three sections: Section A, determined the bio-data(age, marital status, date of birth, number of children, type of occupation) of the participants, Section B, determined the weight, height, body circumferences of the participants, Section C, was a record of the body mass index and waist circumferences. The following materials were used; hand gloves, the stadiometer, measuring tape, and skin-fold calipers.

Anthropometric Measurements

Height and Weight: A stadiometer was used to measure height and weight. Participants stood on the stadiometer with their weight evenly distributed on both feet, without shoes, and wearing light clothing. The heels were placed together, touching the base of the vertical board, with the feet positioned at a slight outward angle of 60 degrees (NHANES, 1998). Weight was recorded to the nearest 0.1 kg, and height was measured from the soles of the feet to the vertex of the head, recorded to the nearest 0.1 cm.

Mid-Upper Arm Circumference: An inelastic measuring tape was used to measure the mid-upper arm circumference. The tape was positioned around the arm midway between the shoulder and the elbow, resting on the skin without compressing it. The measurement was taken to the nearest 0.1 cm.

Forearm Circumference: Forearm circumference was measured using an inelastic tape placed around the forearm approximately one-fourth of the distance distal to the elbow. The measurement was recorded to the nearest 0.1 cm.

Neck Circumference: Neck circumference was measured by wrapping the tape around the neck at the level of the Adam's apple. The reading was recorded to the nearest 0.1 cm.

Waist Circumference: Waist circumference was measured with the participant standing erect. The tape was wrapped around the waist at a point just above the iliac crest (Ross *et al.*, 2008;

NHANES, 1998). The measurement was taken during minimal respiration and recorded to the nearest 0.1 cm.

Hip Circumference: Hip circumference was measured with participants standing upright, feet together, and weight evenly distributed. The tape was wrapped around the widest part of the buttocks, and the measurement was recorded to the nearest 0.1 cm.

Data analysis

Data was analyzed using Statistical Package for Statistical Product and Service Solutions (IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp). Descriptive statistics for continuous variables were presented as mean \pm standard deviation (SD) whereas for categorical variables as frequencies, percentages, and graphs. Analysis of variance (one-way) was used to test for differences in nutritional status, educational background, occupation, and parity. The chi-square test was used to test for significant differences in group membership of categorical variables. All tests were two-tailed with a *P*-value <0.05 and were considered statistically significant.

RESULTS

| Table 1: Descriptive statistics of the medical history and nutritiona |
|---|
| status of menopausal women with Type II Diabetes. |

| Variables | Categories | Frequer | ncy Percent |
|---------------------|-------------------|------------|--------------|
| Contracontivo | Yes | 527 | 75.1 |
| contraceptive | No | 172 | 24.5 |
| | Oral | 64 | 9.1 |
| Tupos of | Injection | 150 | 21.4 |
| rypes of | Implant | 179 | 25.5 |
| contraceptive | All of the above | 137 | 19.5 |
| | None of the above | 172 | 24.5 |
| Pattern of | Regular | 265 | 37.7 |
| menstruation | Irregular | 434 | 61.8 |
| Duration of | < 12 months | 18 | 2.6 |
| Duration of | 1 - 5 years | 351 | 50.0 |
| menopause | > 5 years | 333 | 47.4 |
| | Underweight | 18 | 2.6 |
| Nutritional status | Normal weight | 154 | 21.9 |
| NULTILIOTIAI SLALUS | Overweight | 270 | 38.5 |
| | Obese | 255 | 36.3 |
| Consult doctor | Yes | 348 | 49.6 |
| about menopause | No | 354 | 50.4 |
| Menopause | Yes | 647 | 92.2 |
| awareness | No | 55 | 7.8 |
| Diagnosed of Type | Before menopause | 230 | 32.8 |
| II Diabetes | After menopause | 472 | 67.2 |
| N = 702 (mean | + SD descriptive | statistics | of the study |

N = 702, (mean \pm SD descriptive statistics of the study population).

Table 1 is a Descriptive statistic of the medical history and nutritional status of menopausal women with Type II Diabetes. Among the seven hundred two (702) menopausal women with

type II diabetes in mainland Lagos State that participated in this study, 527 participants representing 75.10% had used contraceptive devices during their child bearing age, and 25.50% of the women used implant type of contraceptives. 67.20% of the women reported having been diagnosed with diabetes type II after menopausal, also the majority of the women were Overweight 270 (38.5%) while the number of underweight was 18 (2.6%).

| Table 2: Descriptive statistics of the socio-demographic status of |
|--|
| menopausal women with T2DM in Lagos mainland, Lagos State |
| Nigeria |

| Variables | Categories | Frequency | Percent | |
|-------------------|------------------------|-----------|---------|--|
| Resident of | Resident of From Birth | | 50.70 | |
| Mainland | Relocated | 342 | 48.60 | |
| Neef | Primi-para | 34 | 4.80 | |
| NU UI children | Multi-para | 385 | 54.80 | |
| children | Grand Multi-para | 283 | 40.30 | |
| | Single | 23 | 3.30 | |
| Marital | Married | 534 | 76.10 | |
| Status | Divorced | 78 | 11.10 | |
| | Widowed | 67 | 9.50 | |
| Level of | None | 33 | 4.70 | |
| | Primary | 205 | 29.20 | |
| Education | Secondary | 284 | 40.50 | |
| | Tertiary | 180 | 25.60 | |
| | Artisan | 128 | 18.20 | |
| Occupation | Civil Servant | 164 | 23.40 | |
| Occupation | Traders | 313 | 44.60 | |
| | Full House Wife | 96 | 13.70 | |

The socio-demographic status of the menopausal women with T2DM (Table 2) shows that among the seven hundred and two (702) menopausal women with type II diabetes in mainland Lagos State that participated in this study, it was observed that 50.70% were resident by birth, 54.80% were multi-parous women, and 76.10% were married. 40.50% of the women had secondary education, while 25.60% had tertiary education, and the majority (44.60%) were traders by occupation.

Table 3 shows that among the seven hundred and two (702) menopausal women with type II diabetes in mainland area of Lagos State that participated in this study, there is a statistical significant difference between the classes of the nutritional status and waist circumference (0.001), mid-upper arm circumference (0.004) and Thigh circumference (with p < 0.001).

Table 4 shows statistical relationship between the various level of education and some Anthropometric parameters weight (0.001), Head circumference (0.001), neck circumference (0.010), thigh circumference (0.032) and also with the age menstruation stops (p < 0.05).

Comparison between the occupation and some anthropometric parameters of menopausal women with T2DM (Table 5) shows that 313 of the women were traders, a statistical significance exist between the various occupation and some Anthropometric parameters (Head 0.001, neck, 0.023. waist <0.001m, hip 0.013).

Table 6 indicates that the waist circumference of the women who are primi-parous (90.44 \pm 3.36 cm) was statistically significantly (p = 0.049, F = 3.03) lower compared to that of women who are multi-parous (92.99 \pm 0.96 cm), and Grand multi-parous

(95.93 \pm 0.92 cm). There was no statistically significant difference observed in the hip circumference and the age at menopause. Based on the level of education. The mid-upper arm circumference of women that are primi-parous (31.56 \pm 0.99 cm) was statistical significantly lower compared to women that are multi-parous (36.11 \pm 0.74 cm) and women grand multi-parous (34.43 \pm 0.56 cm).

Table 3: Comparison between Nutritional status and some Anthropometric parameters of menopausal women with T2DM

| Variable | Underweight | Normal weight | Overweight | Obese | F | Р |
|---------------|----------------|---------------|---------------|---------------|--------|---------|
| n | 18 | 154 | 270 | 255 | - | - |
| WT (kg) | 44.00 ± 2.36 | 62.24 ± 0.62 | 73.43 ± 0.40 | 87.48 ± 0.60 | 363.63 | < 0.001 |
| HT (cm) | 167.94 ± 2.17 | 166.55 ± 0.69 | 163.44 ± 0.40 | 158.45 ± 0.57 | 34.27 | < 0.001 |
| HC (cm) | 58.78 ± 2.65 | 58.65 ± 0.68 | 57.33 ± 0.42 | 57.75 ± 0.37 | 1.25 | 0.292 |
| NC (cm) | 34.94 ± 2.62 | 38.25 ± 0.91 | 36.65 ± 0.49 | 37.56 ± 0.64 | 1.31 | 0.270 |
| WC (cm) | 79.33 ± 3.32 | 92.24 ± 1.54 | 91.54 ± 1.13 | 98.85 ± 0.90 | 14.81 | < 0.001 |
| HC (cm) | 89.94 ± 2.36 | 98.61 ± 1.44 | 103.83 ± 3.49 | 106.19 ± 1.19 | 1.98 | 0.115 |
| MUAC (cm) | 26.89 ± 1.35 | 35.49 ± 1.29 | 34.43 ± 0.62 | 36.42 ± 0.77 | 4.59 | 0.004 |
| CC (cm) | 117.33 ± 35.80 | 94.21 ± 4.34 | 92.75 ± 1.02 | 97.44 ± 1.01 | 0.47 | 0.705 |
| TC (cm) | 43.50 ± 1.60 | 52.62 ± 1.31 | 51.96 ± 1.00 | 54.64 ± 1.08 | 3.21 | 0.023 |
| STPMEN (yrs.) | 47.11 ± 0.73 | 46.62 ± 0.35 | 46.52 ± 0.28 | 46.92 ± 0.27 | 0.42 | 0.736 |

WT: weight, HT: height, HC: head circumference, NC: neck circumference, WC: waist circumference, HC: Hip circumference, MUAC: Mid-upper arm circumference, CC: Chest circumference, TC: thigh circumference, STPMEN: age menstruation stops (years).

| Table 4: Comparison between | the level of education and | some Anthropometric paramet | ers of Menopausal women with T2DM. |
|---------------------------------------|----------------------------|-----------------------------|------------------------------------|
| · · · · · · · · · · · · · · · · · · · | | | |

| Parameters | Non | Primary | Secondary | Tertiary | F | Р |
|---------------|---------------|---------------|---------------|---------------|-------|--------|
| n | 33 | 205 | 284 | 180 | - | - |
| WT (kg) | 69.27 ± 2.17 | 72.11 ± 0.94 | 75.36 ± 0.76 | 79.25 ± 1.14 | 10.85 | <0.001 |
| HT (cm) | 161.61 ± 1.30 | 162.02 ± 0.57 | 162.61 ± 0.51 | 161.99 ± 0.94 | 0.27 | 0.848 |
| HC (cm) | 58.55 ± 1.34 | 59.62 ± 0.65 | 56.52 ± 0.30 | 57.49 ± 0.47 | 7.28 | <0.001 |
| NC (cm) | 37.45 ± 1.58 | 39.16 ± 0.81 | 36.45 ± 0.52 | 36.42 ± 0.65 | 3.84 | 0.010 |
| WC (cm) | 99.91 ± 3.08 | 96.25 ± 1.42 | 92.15 ± 0.95 | 93.48 ± 1.23 | 3.40 | 0.018 |
| HC (cm) | 109.55 ± 1.92 | 102.16 ± 1.28 | 102.06 ± 3.36 | 105.03 ± 1.26 | 0.57 | 0.636 |
| MUAC (cm) | 36.94 ± 2.52 | 35.96 ± 0.82 | 35.25 ± 0.85 | 33.98 ± 0.70 | 1.04 | 0.372 |
| CC (cm) | 97.27 ± 2.66 | 100.20 ± 4.53 | 93.16 ± 1.03 | 93.21 ± 1.07 | 2.02 | 0.111 |
| TC (cm) | 47.18 ± 3.00 | 51.17 ± 1.15 | 54.44 ± 1.05 | 53.42 ± 1.05 | 2.99 | 0.032 |
| STPMEN (yrs.) | 47.21 ± 0.72 | 47.60 ± 0.32 | 46.31 ± 0.27 | 46.32 ± 0.31 | 4.34 | 0.005 |

WT: weight, HT: height, HC: head circumference, NC: neck circumference, WC: waist circumference, HC: hip circumference. MUAC: mid upper arm circumference, CC: chest circumference, TC: thigh circumference, STPMEN: stop menses

Table 5: Comparison between the occupation and some anthropometric parameters of menopausal women with T2D

| Table of companion between the occupation and come and rependence parameters of menopausal women with 125 | | | | | | | | |
|---|---------------|---------------|---------------|---------------|------|--------|--|--|
| Parameters | Artisan | Civil Servant | Traders | FHW | F | Р | | |
| n | 128 | 164 | 313 | 96 | - | - | | |
| WT (kg) | 76.62 ± 0.96 | 74.79 ± 1.24 | 73.9 ± 0.74 | 77.68 ± 1.67 | 2.27 | 0.080 | | |
| HT (cm) | 163.05 ± 0.72 | 161.99 ± 0.84 | 161.83 ± 0.84 | 162.82 ± 0.76 | 0.65 | 0.586 | | |
| HC (cm) | 55.63 ± 0.44 | 58.52 ± 0.69 | 58.38 ± 0.39 | 57.4 ± 0.64 | 5.47 | 0.001 | | |
| NC (cm) | 34.96 ± 0.61 | 38.31 ± 0.94 | 37.57 ± 0.52 | 37.65 ± 1.01 | 3.21 | 0.023 | | |
| WC (cm) | 87.77 ± 1.32 | 93.35 ± 1.56 | 96.71 ± 0.98 | 94.75 ± 1.63 | 8.49 | <0.001 | | |
| HIPC (cm) | 95.41 ± 1.85 | 101.62 ± 1.57 | 107.92 ± 2.98 | 100.68 ± 1.73 | 3.60 | 0.013 | | |
| MUAC (cm) | 33.34 ± 1.02 | 36.04 ± 1.20 | 34.95 ± 0.56 | 36.35 ± 1.32 | 1.43 | 0.234 | | |
| CC (cm) | 51.88 ± 7.07 | 56.27 ± 1.44 | 51.99 ± 0.99 | 51.2 ± 1.50 | 1.68 | 0.174 | | |
| TC (cm) | 51.88 ± 1.59 | 56.27 ± 1.29 | 51.99 ± 0.93 | 51.2 ± 1.41 | 3.12 | 0.026 | | |
| STPMEN (yrs.) | 47.30 ± 0.36 | 45.90 ± 0.35 | 46.86 ± 0.23 | 46.97 ± 0.56 | 2.52 | 0.058 | | |

WT: weight, HT: height, HC: head circumference, NC: neck circumference, WC: waist circumference, HC: hip circumference, MUAC: mid upper arm circumference, CC: chest circumference, TC: thigh circumference, FHW: full house wife, STPMEN: stop menses.

| Table 6: Com | parison between | the number of | f children ar | d some anthro | pometric | parameters of Men | opausal women with T2DM |
|--------------|-----------------|---------------|---------------|---------------|----------|-------------------|-------------------------|
|--------------|-----------------|---------------|---------------|---------------|----------|-------------------|-------------------------|

| Parameters | Primipara | Multipara | Grand multipara | F | Р |
|---------------|---------------|---------------|-----------------|------|-------|
| n | 34 | 385 | 283 | - | - |
| WT (kg) | 73.21 ± 2.89 | 74.88 ± 0.68 | 75.69 ± 0.86 | 0.50 | 0.608 |
| HT (cm) | 160.15 ± 1.54 | 162.38 ± 0.53 | 162.29 ± 0.50 | 0.85 | 0.426 |
| HC (cm) | 56.76 ± 0.79 | 58.24 ± 0.41 | 57.25 ± 0.35 | 2.80 | 0.062 |
| NC (cm) | 36.18 ± 1.64 | 37.72 ± 0.52 | 36.82 ± 0.53 | 0.92 | 0.397 |
| WC (cm) | 90.44 ± 3.36 | 92.99 ± 0.96 | 95.93 ± 0.92 | 3.03 | 0.049 |
| HIPC (cm) | 105.09 ± 3.83 | 103.33 ± 2.50 | 102.8 ± 1.09 | 0.06 | 0.943 |
| MUAC (cm) | 31.56 ± 0.99 | 36.11 ± 0.74 | 34.43 ± 0.56 | 5.19 | 0.006 |
| CC (cm) | 92.29 ± 2.65 | 95.7 ± 2.46 | 95.43 ± 1.05 | 0.13 | 0.881 |
| TC (cm) | 52.91 ± 2.86 | 54.82 ± 0.91 | 50.24 ± 0.83 | 6.48 | 0.002 |
| STPMEN (yrs.) | 47.29 ± 0.76 | 46.66 ± 0.23 | 46.76 ± 0.26 | 0.33 | 0.722 |

WT: weight, HT: height, HC: head circumference, NC: neck circumference, WC: waist circumference, HIPC: hip circumference. MUAC: mid upper arm circumference, CC: chest circumference, TC: thigh circumference, STPMEN: stop menses

DISCUSSION

The study provided convincing evidence that women had a significantly higher risk of developing diabetes during the menopausal transition stages. It was found that both earlier and later age at natural menopause were associated with increased risk of diabetes. The result showed that the mean age of menopausal women with type II diabetes in mainland Lagos State was 55.02±9.23 years, the mean age at menopause was 46.73±4.44 years with an average height of 162.23±9.58 cm, weight was 75.12±11.00 kg. Age at menopause is in line with the recommendation of standard menopausal age by WHO (45 and 55 years). It also agrees with the work of Zhao et al. (2021) who reported that the average age of menopause in the United States is approximately 51 years old. However, the transition to menopause usually begins in your mid-40s. Panwar et al. (2023) reported that there are estimates of the average weight and height of women depending on age, but if a woman lives a balanced lifestyle, she can be healthy regardless of the measurements compared with the average. It can be deduced from the result that women who have four or more children are more susceptible to acquiring type II Diabetes at their menopausal age or age 46 and 47 respectively this is because the majority of the women (63.2%) reported having four or more children followed by those who reported having three children (19.8%). A woman's reproductive life course includes her age at menarche and menopause, the age at which she starts and stops having children the number of children she has, as well as the age she first has sexual intercourse, and the number of sexual partners she has in her lifetime. Some of these reproductive factors have been identified as risk factors for developing Type II Diabetes during menopausal period according to Okoth et al. (2020). The percentage of women who were married are more than others who are divorced or are single mothers. Most of the women who participated are well educated meaning they obtained a tertiary education followed by those who had secondary education. The research was much easier to communicate and well understood by the learned women than the uneducated ones. In terms of occupation of the participant, more of the women are self-employed. The result showed that a total of 44.7% of the participants reported being traders while

23.4% reported working in the public sector. In a research conducted by Riach et al. (2021) he reported that both positive and negative effects were found for women transitioning whilst in employment, and some evidence suggested that menopausal women were unable to seek employment, were reducing their working hours, leaving or losing their job whilst in transitions, and identifying negative impact on their career. Another study found that vasomotor symptoms were associated with impaired work ability, after adjustment for demographic and lifestyle factors (Gartoulla et al., 2016). In terms of use of contraceptives, most of the participants (52.6%) reported using contraceptives whereas, the remaining 47.6% reported not using contraceptives this could be as a result of people's perspective and belief toward the use of contraceptives. Most people are scared of the side effect of contraceptives and they belief it can cause cancer and damages to some organs in the body like kidney, liver.

Just as the onset of menstruation, there is also the onset of menopause and research has shown that the history of health condition of the study participants with keen interest in their type 2 diabetes status and their lifestyle patterns have an impact on the onset of menopause. Menopausal age heritability estimates vary from 44 to 66% for mother-daughter pairs. According to genome-wide association studies, the age at which women enter menopause is strongly linked to various genetic loci. Menopause is also a highly heritable condition (Laven, 2015). The result of this study shows that Family history and genetic factors play a role when a woman begins menopause and may also predict the likely symptoms she will experience. A study by Zhao et al. (2021) discovered that the age at which people began menopause was affected by multiple genes. More than 70% of the population falls into the range of having overweight-to-obesity. People in Asia, on the other hand, have the lowest body mass. Specifically, the average body mass index (BMI) for Japan in 2005 was just 22.9. In comparison, the average BMI in the United States was 28.7. (Zhao et al., 2021).

Lifestyle and environmental factors are reported to be the main causes of extreme increases in the incidence of Type II Diabetes. The result showed Most of the women reported not taking their medication as prescribed this could be a result of unavailability or accessibility of the drugs. 24.3% reported taking their medication irregularly while those who reported regularly taking their medication routine as prescribed by their doctor equaled 19%, most people start taking their drugs when they begin to see the damage or the impact it has done on their body system or organs.

The etiology of Type II Diabetes is complex and is associated with irreversible risk factors such as age, genetics, race, and ethnicity and reversible factors such as diet, physical activity, and smoking.

CONCLUSION: There is a relationship between the nutritional status, among menopausal women with type II diabetes in Lagos mainland, Lagos state Nigeria. Also a statistical significant difference exist between some anthropometric parameters (weight, head, neck, waist, thigh, hip circumferences) and the various categories of the level of education, occupation and number of children.

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