African Scientist Vol. 24, No. 1 March 31, 2023
Printed in Nigeria
1595-6881/2023 $80.00 + 0.00

https://africansciientistjournal.org

AFS2023007/24113

Population-based Survey of Lifestyle Behaviours of Women with Varied Parity and Chronic Disease Statuses in Nigeria: A Discriminant, Classification Analysis

Adeyemi Abayomi Awofala[1]*, Olusegun Emmanuel Ogundele[1], Folake Mary Banjo[1], Mary Abidemi Faleke[2]

[1] Department of Biological Sciences, Tai Solarin University of Education, Ijagun, Ogun State
[2] Department of Human Kinetics and Health Education, Tai Solarin University of Education, Ijagun, Ogun State

*Corresponding author Email: awofalaaa@tasued.edu.ng. Tel: +234 806 877 1877

(Received March 16, 2023; Accepted in revised form March 21, 2023)

ABSTRACT: The study aimed to explore the lifestyle behaviours of women with varied parity and chronic disease statuses in Nigeria. This was a representative of women population in Ogun State in the southwest of Nigeria recruited between March and June 2022 using stratified sampling among the twenty (20) local governments in the three senatorial districts of the state. Data on parity, chronic diseases, health status, dietary patterns, and anthropometric and lifestyle factors were collected using validated questionnaires. A total of seven hundred and ninety (790) women over 18 years old (range: 18 – 78) and average body mass index (BMI) of 25.9 ± 4.3 (range: 15.2 – 44.2) participated in the study. Parity rate and the prevalence of chronic diseases were 50.4% and 14.4%, respectively. Parity was associated with demographic factors as the participants, more of widows and of other ethnic descent, reported direct and inverse relationships of live births with age and level of formal education, respectively. In addition, women with chronic diseases were significantly more common in the younger age group (≤ 44 years) than in the older one (> 44 years) (32.2% vs. 4.7%; $p < 0.05$) and in those more likely to have separated. Moreover, whilst parity was associated with walking and consumption of foods including meat products, eggs and fruits, chronic disease was only associated with physical activity. Our findings reveal that women who are parous and / or with chronic diseases are characterized by higher BMI and more elevated health distress and health interference.

Keywords: Parity, Chronic disease, Lifestyle, Body mass index, Nigeria

Introduction

Women play important role in the well-being of their families and communities. Yet, women of reproductive age are disproportionately affected by chronic diseases (Kanesarajah *et al.*, 2018). Chronic diseases, defined by the WHO as non-communicable diseases (NCDs) that can be managed but not cured, account for about 74% of global deaths, and about 77% of these deaths occur in low- and middle-income countries (WHO, 2022). Common chronic diseases in Nigeria include cardiovascular diseases (CVDs), stroke, diabetes, and cancer and they constitute a major public health concern. In addition, the prevalence of chronic diseases among Nigerian women is particularly high (Janssens *et al.*, 2016). The risk factors for chronic diseases and multi-morbidity – defined as having two or more chronic diseases-in women are varied and can include genetic predisposition, lifestyle behaviours, environmental exposures, and inadequate access to healthcare. For example, women who live in low- and middle-income countries are more likely to be exposed to environmental hazards, such as air pollution and contaminated water, which can increase their risk of chronic diseases and multi-morbidity (WHO, 2020). Additionally, women who engage in unhealthy behaviors, such as smoking, poor diet, and physical inactivity, are at an increased risk for chronic diseases and multi-morbidity (Carr *et al.*, 2020). Given the

significant impact of chronic diseases and multi-morbidity in women, it is important to identify strategies to reduce the burden of these conditions.

Parity, as a key reproductive issue, has been documented to impact the development of chronic diseases (Sanghavi, 2016). But there are conflicting reports about the prevalence of chronic diseases and multi-morbidity in parous versus nulliparous women. A US study found that the prevalence of stroke, heart attack, angina, and cardiovascular disease was higher among parous women than nulliparous women (Xing *et al.*, 2022). Conversely, another study showed that nulliparous women are at an increased risk of developing cardiovascular disease (CVD) (Gutierrez *et al.*, 2017) and type 2 diabetes (T2D) (Dror *et al.*, 2016). Yet, a report noted J-shaped associations between parity number and cardiovascular disease, ischaemic heart disease or stroke risk (Li *et al.*, 2019). Although there has been a plethora of studies on chronic diseases and multi-morbidity in women of reproductive age, little is known about how chronic diseases and their risk factors behave differently or similarly in women who have started having children (parous) versus those who have not or have not yet started having children (nulliparous). In a population of women that is gradually more diverse than was previously believed, childbearing may worsen the chance of multi-morbidity. Alternately, given the rising prevalence of chronic diseases among women generally, the impact of childbearing on linked risk factors may be less substantial than previously thought (Firoz *et al.*, 2013).

Several factors have been identified that increase the risk of chronic diseases and multi-morbidity among both parous and nulliparous women. Age is the most important risk factor, with women over the age of 45 having an increased risk of chronic diseases and multi-morbidity (Zhang *et al.*, 2020). Other risk factors for both parous and nulliparous women include physical inactivity, smoking, alcohol consumption, poor nutrition, and poor sleep quality (Makama *et al.*, 2022). Additionally, nulliparous women are more likely to suffer from mental health problems such as depression and anxiety, which can increase the risk of chronic diseases and multi-morbidity (Kassem *et al.*, 2019).

Although the persistent rise and public health consequences of chronic diseases are evident in Nigeria and in many African countries, our understanding of the key factors as well as the most at-risk women group for tailored interventions has advanced rather slowly. To the best of our knowledge, there is dearth of information on the profile of women with parity and chronic disease and conditions using a representative sample of the women population of Ogun State in Nigeria. The identification of the correlates of parity and chronic diseases could facilitate a clearer understanding of the relationships of factors impacting parity and chronic diseases, and provide greater insight into the health status of women in reproductive age. Thus, our study aimed to assess the distribution of lifestyle factors among women population of Ogun State, overall and in women with different parity and chronic disease states.

Materials and methods

Design: This was a cross-sectional population-based study that estimated parity rate, prevalence of chronic diseases as well as prevalence of health and lifestyle behaviours among Nigerian women.

Setting and demographic characteristics: In total seven hundred and ninety (790) women aged 18 to 78 years participated in the survey. To ensure the study sample match the public women population of Ogun State, a stratified sampling method was used to select four (4) public hospitals across the three (3) senatorial districts – 2 in Ogun East covering 10 Local Government Areas, 1 in Ogun Central covering 5 Local Government Areas, and 1 in Ogun West covering 5 Local Government Areas – from where recruitment and then data collection using self-reported questionnaire by trained research assistants took place between March and June 2022. Participants signed informed consent before enrolling in the study and for the use of their data for scientific research. The study protocol (TETFUND/TASUED/IBR2017/TEAM6) had approval by the Tai Solarin University of Education Institutional Review Board. Based on the objectives of the study, participants were non-pregnant females with a minimum of 18 years of age who completed both the reproductive health component and the chronic disease conditions component of the questionnaire. A set of socio-demographic characteristics, health status and reproductive health, medical history, dietary habits, as well as information regarding life style behaviour such as smoking and physical activity were self-reported in the interview-administered questionnaire. Age in years was a continuous variable and also classified into four categories: 18–24 years old, 25–44 years old, 45–64 years old and more than 65 years old. Educational level was classified in five categories namely, no formal education, primary education, secondary education, college or polytechnic education, university education. Ethnicity involved Yoruba, Hausa, Ibo and others while marital status was classified under married, single, divorced, separated, and widow.

Assessments of health status, reproductive health and medical history, anthropometry and lifestyle factors: The health survey questionnaire included a four-item each on health distress, and health interference (Lorig *et al.*,

1996; 2001). The health distress part asked the following: "How much during the past 2 weeks: (a) were you discouraged by your health problems?, (b) were you fearful about your future health?, (c) was your health a worry in your life?, and (d) were you frustrated by your health problems?" with response options "none of the time", a little of the time", "some of the time", "a good bit of the time", "most of the time" or "all of the time". The health interference part asked: "During the past 2 weeks, how much has your health interfered with your: (a) normal social activities with family, friends, neighbours or groups?, (b) hobbies or recreational activities?, (c) household chores?, and (d) errands and shopping?" with response options "not at all", "slightly", "moderately", "quite a bit" or "almost totally".

The survey on reproductive health involved parity status and asked: "What is the total number of live births (live-born children) you had?" Using this question, we identified binary parity status variable (no live or never gave a birth as coded "0" and at least one or more live birth as coded "1").

Medical history of chronic diseases involving obesity, hypertension, diabetes, cancer, cardiovascular disorders, asthma, stress, arthritis, insomnia and depression were defined through questions asking whether doctor informed them of having the condition in the past year, and were dichotomized to either no, coded as "0" or yes, coded as "1".

Body mass index (BMI) was calculated as weight (kilograms) divided by square of height (metres). Obesity was defined as BMI > 29.9 kg/m^2, overweight as BMI 25–29.9 kg/m^2, normal as BMI 18.5–24.9 kg/m^2, and underweight as BMI < 18.5 kg/m^2, according to the WHO classification.

Smoking status was obtained using a question about current smoking status and depicted as current, former and never. The physical activity questionnaire involved the type of exercise and duration of exercise and asked: "During the past week, even if it was not a typical week for you, how much total time did you spend on each of the following: (a) stretching or strengthening exercise?, (b) walk for exercise?, (c) swimming or aquatic exercise?, (d) bicycling (including stationary exercise bike?" with response options "none of the time", less than 30 mins/week", "30-60 mins/week", "1-3hrs/week", "more than 3hrs/week".

Assessment of dietary pattern: Food groups involving cereals and cereal products, eggs and egg dishes, fats and oils, fish & fish products, fruit, meat and meat products, milk and milk products, potatoes, vegetables, and alcohol intake were measured from a standard food frequency questionnaire (FFQ) with ratings involving a 10 point scale from Never to Everyday. The questionnaire is similar to the validated food frequency questionnaire (FFQ) by Mulligan and colleagues and was analyzed using feta software (Mulligan *et al.* 2014).

Data analysis: Descriptive statistics was calculated first for the women cohort as a whole and then separately by parity and chronic disease status. Kolmogorov–Smirnov test was used to assess normality of the continuous variables. Continuous variables with normal distributions were presented as mean ± standard deviation (SD) whilst those with skewed distributions as median (q1:1st quartile, q3:3rd quartile). Categorical variables were presented as absolute (n) and relative (%) frequency. Student's t-test for difference in mean values, Mann–Whitney U-test for skewed variables, and then Chi-square test for difference in counts and frequency were used for the comparison of the groups (parity and chronic disease status) with respect to normal and skewed continuous measures or to evaluate any association between the groups and the characteristics of the participants, as appropriate. Discriminant classification analysis was used to evaluate the set of dietary and health variables that discriminate between the parity and chronic disease groups and to classify each of these variables into these groups (Antonogeorgos *et al.*, 2009). The analysis was carried out using *STEPDISC* and *DISCRIM* procedures, respectively. The former was first used to select the dietary and health variables involving alcohol intake, BMI, health distress and health interference with potential discriminatory power between the groups. The latter procedure was performed to develop discrimination model using these selected variables with the calculation of Wilk's lambda (the closer to 1, the better the discriminating ability) and Fisher's classification function coefficients to evaluate the patterns of characteristics of women with respect to their overall parity and chronic disease states and by their four age groups (18–24, 25–44, 45–64 and 65+ years old). All statistical tests performed were two-sided, with the statistical significance level set at $\alpha = 0.05$. All analyses were performed using SAS software (SAS Institute Inc., Cary, NC, USA).

Results

Participants' characteristics with respect to demographic and educational statuses were presented in Table 1. Of the 790 eligible participants, the mean age was 31 ± 10 years (36% (n = 280) aged 18-24 years old, 53% (n = 420) aged 25-44 years old, 10% (n = 86) aged 45-64 years old, and 1% (n = 4) aged 65 years and older), 624 (79.8%) were of Yoruba descent, 50% (n = 395) were married, and 47% (n = 365) had completed a university degree. More details about these are in Table 1.

The parity rate and the prevalence of chronic diseases and conditions were 50.4% and 14.4% respectively. Among the women, the most prevalent chronic diseases and conditions were stress (34.4%), obesity (18.9%), depression (9.2%), followed by hypertension (7.8%), diabetes (7.1%), arthritis (4.4%), cardiovascular disorders (2.3%), and cancer (1.3%).

Parous women were significantly older than their nulliparous counterparts (36 ± 11 vs. 26 ± 7 years old, $p < 0.01$). Conversely, women with chronic diseases and conditions were somewhat significantly younger than those without chronic diseases and conditions (29 ± 8 vs. 32 ± 11 years old, $p < 0.01$) (Table 1). The proportion of women with live births among those aged 18-24 years old, 25-44 years old, 45-64 years old, and more than 65 years old were 21.4%, 60.7%, 91.9% and 100.0%, respectively ($p < 0.01$). Similarly, the prevalence of chronic diseases and conditions in the four age groups were 17.9%, 14.3%, 4.7% and 0.0%, respectively ($p < 0.05$).

We found statistically significant differences among the parity groups with respect to educational status, ethnicity and marital status ($p < 0.05$), whereas we did not find any statistically significant associations between chronic disease groups ($p > 0.05$) with respect to educational status and ethnicity. In addition, the highest parity rate was identified among individuals who completed only primary education (75.0%; $p < 0.01$) while the largest prevalence of chronic diseases and conditions were identified among individuals who had no formal education training (27.3%, $p > 0.05$). The parity rate and the prevalence of chronic diseases and conditions largely decreases as educational level increases, though, this did not reach statistical significance in the chronic disease groups. Moreover, the highest parity rate was reported among widow (90.0%, $p < 0.01$), whilst the largest prevalence of chronic diseases and conditions was reported among separated women (30.8%, $p < 0.05$) (Table 1).

The participants' characteristics with respect to lifestyle factors presented across parity as well as chronic disease groups were shown in Table 2. We observed a higher proportion of current smokers among parous women (parity = yes) (n = 20, 55.6%) and a smaller proportion of women with chronic diseases and conditions (n = 5, 13.9%) among current smokers. However, we did not find any statistically significant association between smoking status and either parity or chronic disease groups ($p > 0.05$). In addition, significant differences in the parity rate and the prevalence of chronic diseases with respect to common types of exercise were observed ($p < 0.01$). The most common type of exercise was walking (Median (Mdn) = 148.5; q1 =49.5, q3 = 148.5) and showed significant differences in the parity and chronic disease groups. Of note, we recorded 1 as the median values for swimming and bicycling, indicating no or rare type of such exercises among the participants. We however recorded statistically significant differences in the swimming and bicycling forms of physical activity between women with chronic diseases and those without.

The median values for the various foods consumed by the participants indicate diverse patterns between parous and chronic disease groups (Table 2). We did not find any statistical difference in the various foods consumed between the chronic disease groups. However, we found that women with live births significantly consumed less of food groups involving meat and meat products, eggs and egg dishes, cereal products, fats and oils, and fruits compared to nulliparous women. Other food groups including fish products, vegetables and alcohol intake did not reach statistical significance between parous and nulliparous women. Notably, the median value for the consumption of alcohol was 1, which indicates no or rare consumption among the participants.

The average BMI across parity and chronic disease groups showed that women with live births had a significantly higher BMI compared to those without (Table 2). Specifically, we observed respectively, a higher proportion of overweight and obesity in parous (n = 168, 59.2% and n = 106, 70.7%) when compared with nulliparous (n = 116, 40.8% and n = 44, 29.3%) women, and a smaller proportion of overweight and obesity in women with chronic diseases (n = 38, 13.4% and n = 25, 16.7%) when compared with those without (n = 246, 86.6% and n = 125, 83.3%), ($p < 0.01$). We also reported a significantly higher health distress in women with live births compared to their nulliparous counterparts (Mdn = 3; q1 = 0, q3 = 6 vs. Mdn = 1; q1 = 0, q3 = 4) ($p < 0.001$) (Table 2). In the high health distress and interference groups, we reported a non-significantly ($p > 0.05$) higher parity rate and prevalence of chronic disease as compared with the corresponding percentages in the low health distress and interference groups.

Table 3 presents the results of a discriminant analysis providing the linear discriminant function coefficients. The analysis suggests that women with chronic diseases had higher BMI and are more likely to suffer from increased health distress and interference. In addition, women with live births had a higher BMI and more health distress contributing to their classification as being parous. The results by age group gave the coefficients for the discriminant function of age class. These constitute the linear combinations of the responses that define each parameter of BMI, health distress, health interference, and alcohol. Generally, we found positive estimates across the age groups for BMI, health distress, health interference, but alcohol intake in the 45-64 years old and 65 years and older groups.

Table 1. Socio-demographic characteristics by parity and chronic disease statuses

Characteristics	Overall (n=790)	Parity		p-value	Chronic Diseases		p-value
		NO (n = 392)	YES (n = 398)		NO (n = 676)	YES (n = 114)	
Age (years), Mean (SD)	31.0 ± 10.3	26.0 ± 6.9	36.0 ± 10.6	**< 0.01**	31.5 ± 10.6	28.5 ± 8.0	**<0.01**
Age group, n^a (%)				**< 0.01**			**0.02**
18 - 24	280 (35.4)	220 (78.6)	60 (21.4)		230 (82.1)	50 (17.9)	
25 - 44	420 (53.2)	165 (39.3)	255 (60.7)		360 (85.7)	60 (14.3)	
45 -64	86 (10.9)	7 (8.1)	79 (91.9)		82 (95.3)	4 (4.7)	
65+	4 (0.5)	0 (0.0)	4 (100.0)		4 (100.0)	0 (0.0)	
Educational Status, n^b (%)				**<0.01**			0.10
No Formal Education	11 (1.4)	10 (90.9)	1 (9.1)		8 (72.7)	3 (27.3)	
1º Education	32 (4.1)	8 (25.0)	24 (75.0)		25 (78.1)	7 (21.9)	
2º Education	110 (14.1)	49 (44.5)	61 (55.5)		91 (82.7)	19 (17.3)	
College Education	260 (33.4)	142 (54.6)	118 (45.4)		218 (83.8)	42 (16.2)	
University Education	365 (46.9)	177 (48.5)	188 (51.5)		325 (89.0)	40 (11.0)	
Ethnicity, n^c (%)				**0.01**			0.18
Yoruba	624 (79.8)	326 (52.2)	298 (47.8)		528 (84.6)	96 (15.4)	
Hausa	27 (3.5)	12 (44.4)	15 (55.6)		21 (77.8)	6 (22.2)	
Ibo	107 (13.7)	44 (41.1)	63 (58.9)		98 (91.6)	9 (8.4)	
Other	24 (3.1)	6 (25.0)	18 (75.0)		21 (87.5)	3 (12.5)	
Marital Status, n^a (%)				**<0.01**			**0.04**
Married	395 (50.0)	60 (15.2)	335 (84.8)		345 (87.3)	50 (12.7)	
Single	350 (44.1)	323 (92.3)	27 (7.7)		290 (82.9)	60 (17.1)	
Divorced	12 (1.5)	3 (25.0)	9 (75.0)		11 (91.7)	1 (8.3)	
Separated	13 (1.6)	3 (23.1)	10 (76.9)		9 (69.2)	4 (30.8)	
Widow	20 (2.5)	2 (10.0)	18 (90.0)		20 (100.0)	0 (0.0)	

Abbreviations: SD, Standard Deviation; $^a n$ =790; $^b n$ =778; $^c n$ =782. Bold values indicate statistically significant association ($p < 0.05$).

Table 2. Lifestyle factors by parity and chronic disease statuses

Characteristics	Overall (n = 790)	Parity		p- value	Chronic Diseases		p-value
		NO (n = 392)	YES (n = 398)		NO (n = 676)	YES (n = 114)	
Smoking status, n^a (%)				0.83			0.86
Never Smoker	697 (88.7)	346 (49.6)	351 (50.4)		599 (85.9)	98 (14.1)	
Former Smoker	53 (6.7)	26 (49.1)	27 (50.9)		47 (88.7)	6 (11.3)	
Current smoker	36 (4.6)	16 (44.4)	20(55.6)		31 (86.1)	5 (13.9)	
Physical activity, Mdn (IQR)							
Stretching	60 (0, 60)	60 (0 , 60)	60 (0 , 60)	0.6	60 (0, 60)	60 (0, 60)	0.21
Walking	148.5 (49.5, 148.5	148.5 (49.5, 148.5)	148.5 (49.5, 396)	**<0.01**	49.5 (49.5, 148.5	148.5(148.5, 59-	**<0.01**
Swimming	1 (1, 105)	1 (1, 105)	1 (1, 105)	0.11	1 (1, 105)	105 (0, 105)	**<0.01**
Bicycling	1 (1, 105)	1 (1, 105)	1 (1, 105)	0.74	1 (1, 105)	105 (0, 105)	**<0.01**
Food consumption, Mdn (IQR)							
Meat and meat products	137.8 (76, 240.2)	151.8 (83.5, 264.2)	116 (68.1, 214.9)	**<0.01**	137 (75.8, 242.6	143.7 (82, 210.9	0.61
Fish products	54.5 (27.2, 134.2)	54.5 (27.2, 167.3)	49 (27.2, 134.2)	0.36	54.5 (27.2, 134.2	46.5 (19.3, 167.2	0.24
Vegetables	90.7 (51.4, 157.1)	89.5 (45.3, 159.4)	92.2 (55.7, 151.4)	0.72	89.9 (52.4, 156.1	95 (40, 164.7)	0.36
Milk product	181.3 (163.6, 306.	187.9 (163.6, 310.6)	181.3 (163.6, 299.6)	0.09	181.3 (163.6, 29	194.4 (163.6, 31	0.11
Egg and egg dishes	21.5 (7, 39.5)	21.5 (7, 39.5)	21.5 (7, 39.5)	**<0.01**	21.5 (7, 39.5)	21.5 (7, 39.5)	0.50
Cereal product	272.3 (163, 425.6)	331.8 (195.9, 494.0)	247.96 (141.4,388.4)	**<0.01**	271.3 (163.8, 41	291.6 (157.1, 50	0.61
Potatoes	29.5 (17.6, 59.1)	29.5 (17.6, 108.4)	29.5 (17.6, 59.1)	0.19	29.5 (17.6, 59.1)	21.5 (7, 39.5)	0.87
Fruits	195.2 (111.2, 321.	210.7 (116.9, 337.0)	173.4 (104.7, 296.9)	**<0.01**	188.8 (111.1, 32	214.4 (117.6, 32	0.19
Fat and Oil	9.6 (5.5, 20.1)	12.0 (5.7, 22.7)	7.8 (5.0, 18)	**<0.01**	8.8 (5.4, 20)	12.7 (5.7, 21.7)	0.13
Alcohol intake	1.0 (1.0, 1.6)	0.5 (0.1, 1.7)	1.0 (1.0, 1.6)	0.09	1.0 (1.0, 1.6)	1.0 (1.0, 1.8)	0.93

Characteristics	Overall (n = 790)	Parity NO (n = 392)	Parity YES (n = 398)	p- value	Chronic Diseases NO (n = 676)	Chronic Diseases YES (n = 114)	p-value
Obesity							
BMI (kg/m^2), Mean (SD)	25.9 ± 4.3	24.5 ± 4.0	27.3 ± 4.2	**<0.01**	26.1 ± 4.3	25.1 ± 4.6	0.05
BMI, n^b (%)							
Underweight	40 (5.1)	26 (65.0)	14 (35.0)	**<0.01**	25 (62.5)	15 (37.5)	**<0.01**
Normal weight	316(40.0)	192 (60.8)	124 (39.2)		261 (82.6)	55 (17.4)	
Overweight	284 (35.9)	116 (40.8)	168 (59.2)		246 (86.6)	38 (13.4)	
Obese	150 (19.0)	44 (29.3)	106 (70.7)		125 (83.3)	25 (16.7)	
Health status							
Health distress Mdn (IQR)	2 (1, 5)	1 (0, 4)	3 (0, 6)	**<0.01**	2 (0, 5)	1 (0, 5)	0.64
Health distress, n^b (%)							
High	56 (7.1)	24 (42.9)	32 (57.1)	0.26	45 (80.4)	11 (19.6)	0.18
Low	734 (92.9)	369 (50.3)	365 (49.7)		632 (86.1)	102 (13.9)	
Health interference Mdn (IQR)	2 (1,5)	2 (0, 5)	3 (0, 5)	0.27	2 (0, 5)	1 (0, 6)	0.23
Health interference, n^b (%)							
High	103 (13.0)	52 (50.5)	51 (49.5)	0.95	82 (79.6)	21 (20.4)	0.07
Low	687 (86.9)	338 (49.2)	349 (50.8)		592 (86.2)	95 (13.8)	

Abbreviations: SD, Standard Deviation; Mdn, Median; IQR, Interquartile Range; $^a n$ =786; $^b n$ =790. Bold values indicate statistically significant association ($p < 0.05$).

Table 3. Discriminant analysis (standardized Fisher's classification function coefficients, reference category: No parity and No chronic diseases, respectively)

Characteristics	Parity	Chronic Diseases	Age Group 18-24	25-44	45-64	65+
Health distress (per 1 unit)	0.23	**0.23**	0.25	0.17	0.15	0.10
Health interference (per 1 unit)	**0.17**	**0.01**	0.07	0.12	0.22	0.52
BMI (per 1 kg/m^2)	**1.69**	**1.39**	1.47	1.60	1.71	1.81
Alcohol intake (per 1 g/day)	0.06	0.10	0.07	0.06	-0.01	-0.10

Bold values indicate the most dominant factors in each classification

Discussion

In this cross-sectional study of data from a population-based survey of Nigerian women, we assessed patterns in socio-demographic and lifestyle factors, dietary habits, and health status in relation to parity and chronic diseases. The parity rate and the prevalence of chronic diseases were 50.3% and 14.9%, respectively. Parity was associated with demographic factors including age, education status, ethnicity and marital status. The participants, more of widows and of other ethnic descent, reported a direct and inverse relationship of live births with age and level of formal education, respectively. In addition, chronic diseases and conditions were associated with age and marital status among the surveyed women. The women were significantly younger and more likely to have separated. Moreover, whilst parity was associated with walking as a form of physical activity as well as consumption of foods including meat products, eggs and fruits, chronic diseases and conditions were associated with walking, swimming and bicycling forms of exercise. Our findings reveal that women who are parous and/or with chronic diseases and conditions are characterized by a poorer health status – increase in health distress and health interference – and higher BMIs.

The association of parity and chronic diseases with known socio-demographic factors is particularly noteworthy. For instance, age as one of the factors associated with increasing parity and decreasing chronic diseases among women of reproductive age may be due to the fact that being older increases the chances of having had a previous pregnancy (Martínez-Galiano *et al.*, 2019). In addition, report indicated that incidence of chronic diseases has increased in younger individuals from 1990 to 2017 (Reddy and Mathur, 2021). More so, the inverse association of education with parity rate and chronic diseases is in line with other research studies (Lynch *et al.*, 2006; Dégano *et al.*, 2017).

In our study, women who were parous rarely engaged in several forms of physical activity involving swimming, bicycling but walking. We also observed a non-significant difference between parous and nulliparous women with respect to these forms of physical activity but walking. Interestingly, earlier studies have suggested that being multiparous is associated with being overweight (Melzer and Schutz, 2010; Chopra *et al.*, 2013), most likely due to excess weight retained after giving birth. A more recent longitudinal study reported that women who became parous had a significantly decreased physical activity in comparison to those who remained nulliparous after 6 years (Makama, *et al.*, 2022). As physical activity is a key driver of weight gain (Brown *et al.*, 2016), our findings linking parity rate with increased BMI, is therefore particularly noteworthy. Consistently with this, we also reported that parous women consumed more meat and meat products, egg and egg dishes and lower cereal products, fruits and fat and oil. This dietary pattern could be a plausible explanation to the observed increase in BMI. Interestingly, women who became parous have been reported to possess increased energy intake more than those who remained nulliparous (Makama *et al.*, 2022). Thus in line with our study, the more children a woman had, the more likely she was to become obese (Melzer and Schutz, 2010; Hill *et al.*, 2016).

Another important finding of our study was the significant difference in physical activity involving walking, swimming and bicycling between women with chronic diseases and those without. The median values for these forms of activity were higher in women with chronic diseases. Similarly, while these women, on average, maintained a relatively normal weight, a substantial proportion of them were underweight. Indeed, an explanation for this difference could stem from varied response to lifestyle modifications among the surveyed women. We reported a higher intake of nutrient-dense foods such as fruits, vegetables, milk products, eggs and egg dishes, and cereals in women with chronic diseases compared to those without. This intriguing finding according to Schulze *et al.* (2018) and Ogundele *et al.* (2022) is expected to be associated with a number favourable health outcome. It is however, not clear if the higher consumption of these foods is a consequence of the presence of chronic diseases and conditions.

Discriminant analysis suggests that parous women and women with chronic diseases and conditions are characterized by a poorer health status and elevated BMI. Women who suffer elevated levels of health distress, health interference, and BMI possess higher parity rate and a higher risk of developing chronic diseases and conditions. This in turn may alter women's physical, mental, and social functions and thus greatly affect their quality of life. Indeed, multiparous women and women with chronic diseases and conditions are facing major struggles such as feelings of distress, higher expenditures, anxiety, depression, and frustration (Gerontoukou *et al.*, 2015)

Our study has some limitations. First, the cross-sectional design indicates that only association but not causal relationship could be examined. In addition, we cannot state if the participants with poorer health status and/or elevated BMI already had these outcomes before their reproductive ages or before developing their chronic diseases. Moreover, the severity of the chronic diseases and conditions is not considered during data collection. Finally, as we have earlier indicated, the dietary and life style factors may have preceded not only parity but also the outset of chronic diseases rather than being the consequence of the two outcomes.

In conclusion, this study showed that parous women and women with chronic diseases have elevated BMI as well poorer health status as indicated by increased health distress and raised health interference. Our findings have some implications for women reproductive health care and suggest that appropriate programmes that focus on positive impacts of improved health status and lower BMI in women of reproductive age or those with chronic diseases should be developed.

Funding

This research was funded by TETFund Institution-Based Research (TETFund-IBR) 2017 Grant.

Acknowledgements

The authors would like to thank all of the women who participated in the study and all of the research assistants who were involved in the questionnaire distributions and collections.

Conflict of interest

None declared.

References

Antonogeorgos G, Panagiotakos DB, Priftis KN, Tzonou A: Logistic regression and linear discriminant analyses in evaluating factors associated with asthma prevalence among 10- to 12-years-old children: Divergence and similarity of the two statistical methods. Int J Pediatr, 952042. 2009.

Brown WJ, Kabir E, Clark BK, Gomersall SR: Maintaining a healthy BMI: data from a 16-year study of young Australian women. Am J Prev Med, 51, e165–78. 2016.

Carr D, Spinelli M, Springmann M: The global burden of chronic diseases and multi-morbidity: A systematic review. The Lancet, 395(10224): 809–823. 2020.

Chopra SM, Misra A, Gulati S, Gupta R: Overweight, obesity and related non-communicable diseases in Asian Indian girls and women. Eur J Clin Nutr. 67: 688-696. 2013.

Dégano IR, Marrugat J, Grau M, Salvador-González B, Ramos R, Zamora A, Martí R, Elosua R: The association between education and cardiovascular disease incidence is mediated by hypertension, diabetes, and body mass index. Sci. Rep, 7, 71–72. 2017.

Dror DM, Jerkins TW, Hivert MF, Meigs JB: Parity and the risk of type 2 diabetes in women. Diabetologia, 59(1): 104-112. 2016.

Firoz T, Chou D, von Dadelszen P, Agrawal P, Vanderkruik R, Tunçalp O, Magee LA: Measuring maternal health: focus on maternal morbidity. Bull World Health Organ, 91: 794-796. 2013.

Gutierrez OB, Ha M, Balk EM, Snetselaar LG: Parity and risk of cardiovascular disease in women: A systematic review and meta-analysis. Am J Epidemiol, 186(5): 521-530. 2017.

Gerontoukou EI, Michaelidoy S, Rekleiti M, Saridi M, Souliotis K: Investigation of anxiety and depression in patients with chronic diseases. Health Psychol Res, 3(2): 2123. 2015.

Hill B, McPhie S, Skouteris H: The role of parity in gestational weight gain and postpartum weight retention. Women's Health Issues, 26: 123-129. 2016.

Janssens W, Goedecke J, De Bree GJ, Aderibigbe SA, Akande TM, Mesnard A: The financial burden of non-communicable chronic diseases in rural Nigeria: Wealth and gender heterogeneity in health care utilization and health expenditures. PLoS One, 11(11): e0166121. 2016.

Kanesarajah J, Waller M, Whitty JA, Mishra GD: Multi-morbidity and quality of life at mid-life: a systematic review of general population studies. Maturitas, 109, 53-62. 2018.

Kassem L, Shaban R, Abdel-Razzak Z, El-Hennawy: Mental health among nulliparous and parous women in Suez Canal University hospitals, Egypt J Basic Clin Reprod Sci, 8(1): 1–8. 2019.

Li W, Ruan W, Lu Z, Wang D: Parity and risk of maternal cardiovascular disease: a dose–response meta-analysis of cohort studies. Eur J Prev Cardiol, 26(6): 592-602. 2019.

Lorig KR, Ritter P, Stewart AL, Sobel DS, Brown Jr BW, Bandura A, Gonzalez VM, Laurent DD, Holman HR: Chronic disease self-management program: 2-year health status and health care utilization outcomes. Medical Care, 39(11): 1217-1223. 2001.

Lorig K, Stewart A, Ritter P, González V, Laurent D, Lynch J: Outcome Measures for Health Education and other Health Care Interventions. Thousand Oaks CA: Sage Publications. p. 25, 52-53. 1996.

Lynch J, Smith GD, Harper S, Bainbridge K: Explaining the social gradient in coronary heart disease: Comparing relative and absolute risk approaches. J Epidemiol Community Health. 60: 436–441. 2006.

Makama M, Earnest A, Lim S, Skouteris H, Hill B, Teede H, Boyle JA, Brown WJ, Hodge AM, Moran LJ: Assessing patterns of change in lifestyle behaviours by parity: a longitudinal cohort study. Int J Epidemiol, 52(2): 589-599. 2023

Martínez-Galiano JM, Hernández-Martínez A, Rodríguez-Almagro J, Delgado-Rodríguez M, Gómez-Salgado J: Relationship between parity and the problems that appear in the postpartum period. Sci Rep, 9(1), 11763. 2019.

Melzer K, Schutz Y: Pre-pregnancy and pregnancy predictors of obesity. Int J Obes, 34(Suppl. 2): S44-S52. 2010.

Mulligan AA, Luben RN, Bhaniani A, Parry-Smith DJ, O'Connor L, Khawaja AP, Forouhi NG, Khaw KT: A new tool for converting food frequency questionnaire data into nutrient and food group values: FETA research methods and availability. BMJ Open, 4(3), e004503. 2014.

Ogundele OE, Awofala AA, Awofodu AD, Ojo FT: Food intake in relation to obesity and subjective cognitive complaints: A cross-sectional study from Nigeria. J Sains Kesihatan Malays, 20(2): 69-76. 2022.

Reddy KS, Mathur MR: Global Burden of CVD. Prevalence, Pattern and Trends. Hand book of Global Health. Chan:Springer International Publishing. pp. 423–437. 2021,

Sanghavi M, Kulinski J, Ayers CR, Nelson D, Stewart R, Parikh N, deLemos J, Khera A: Association between number of live births and markers of subclinical atherosclerosis: The Dallas heart study. Eur J Prev Cardiol, 23(4): 391-399. 2016.

Schulze MB, Martínez-González MA, Fung TT, Lichtenstein AH, Forouhi NG: Food based dietary patterns and chronic disease prevention. BMJ, 361: K2396. 2018.

World Health Organization (WHO): Chronic diseases and multi-morbidity: Women. [Internet]. World Health Organization; [cited 2022 Mar 10]. Available from: https://www.who.int/news-room/fact-sheets/detail/chronic-diseases-and-multi-morbidity-women. 2020.

World Health Organization (WHO): Non-communicable diseases. [Internet]. World Health Organization; [cited 2022 Mar 6]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases. 2022.

Xing Z, Alman AC, Kirby RS: Parity and risk of cardiovascular disease in women over 45 years in the United States: National health and nutrition examination survey 2007–2018. J Womens Health (Larchmt), 31(10): 1459-1466. 2022.

Zhang Y, Chen Y, Fu G, Xu X, Wang S: Prevalence of chronic diseases and associated risk factors among parous and nulliparous women in China: A cross-sectional study. BMC Women's Health, 20(1): 1–7. 2020.