

Research Article

Incidence of nausea and vomiting of pregnancy among Nigerian women

Chigeru Wodi ^{1*}, Barnabas Danborno¹, Adebisi. S. Sunday¹, Ukpai A. Eze²

¹Department of Human Anatomy, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria

²Department of Medical Laboratory Sciences, College of Health Sciences, Ebonyi State University, Abakaliki, Nigeria

***Corresponding author**

Chigeru Wodi

Email: chitwodi@yahoo.com

Abstract: This study investigates the incidence of nausea and vomiting of pregnancy (NVP) and some factors associated with increased risk of suffering NVP. The results showed that an early menarcheal age, higher level of education, increased parity and age at menopause associated significantly ($P < 0.05$) with NVP in one group but not in the other. An increased proportion of women born in wet season, having higher economic status, had an early child birth and carrying female foetuses reported having NVP. So also were variations in the ethnic report of NVP among the study population. This study also suggest a high prevalence (43.71%) of NVP among Nigerian women and an increased incidence over the years with women of Igbo origin having the highest incidence (53.91%) and Hausa's the least incidence (34.80%).

Keywords: NVP, incidence, prevalence and demographic factor

INTRODUCTION

Nausea and vomiting of pregnancy (NVP) commonly known as 'morning sickness' occur in about 80% of all pregnant women [1]. Its onset is between the fourth and tenth week of pregnancy and usually resolve about the twentieth week of gestation [2]. Even with increased incidence and the earliest record dated back to second century AD [3], the aetiology of NVP is poorly understood. Although, the evolutionary adaptation theory proposes that mild degrees of NVP causes no harm to the mother or embryo, and therefore, may be a beneficial adaptation rather than a disease or disorder which have probably evolved to serve a useful function of protecting both mother and embryo from food-borne infections and toxins, teratogens and substances capable of terminating pregnancy [4]. Plausible to the evolutionary theory is the evidence showing women with NVP have a more positive pregnancy outcome [5]. However, severe nausea and vomiting known as *hyperemesis gravidarum* which is characterized by severe intractable vomiting requiring hospitalization has become the third leading cause of hospitalization during pregnancy due to dehydration, malnutrition, and electrolyte imbalances [6].

There is increasing evidence that NVP has emerged as a common phenomenon among urbanized human population with increased genetic heterogeneity as its occurrence is rare among foraging population such as the Bushmen of South Western Africa and the Amazonian Amerindian tribes with well documented genetic homogeneity [7]. Consequently, immunomodulation necessary for successful survival of

the foetus is no longer asymptomatic but associated with dysphoria. Hence, conception has become easy to recognize but hard to accommodate due to wide immunogenetic differences between mother and foetus [7] (Richard, 2002). Profet [8] speculated that the variability in pregnancy sickness among women in industrial societies may be due to variations in dietary toxicity or decreasing selection pressures for detecting and avoiding substances that emit Pleistocene cues of toxicity and proposed a comparison of variability among women in industrial societies and hunter-gatherer societies in order to determine whether pregnancy sickness is more variable among the former.

The incidence of NVP varies across different countries [9] and ethnic differences in the reporting of health problems has become vital in order to find out the reason why patients in same environment experience diseases and treatment differently, and also to expand approaches for the improvement of public health [10]. Nausea and vomiting of pregnancy has been associated with race and ethnicity and the reason is unknown but it has been proposed that the difference in incidence between ethnic groups could be accounted for by important socioeconomic variables [11, 12]. Some literatures have also speculated that genetic factors may explain the difference as to why the degree of occurrence varies among ethnic groups [13, 14]. Apart from the ethnic difference in the occurrence of NVP, some anthropometric and demographic factors have also been associated with NVP as studies have reported association between maternal age, body weight, parity, sex of foetus, family history and

experience in previous pregnancy as factors which bears increased risk of developing severe NVP [15].

The aims of this study is therefore to determine the prevalence and incidence of nausea and vomiting of pregnancy in Nigeria and its subpopulations based on ethnicity and also to establish reproductive and socio-demographic characteristics which bears increase risk for NVP.

METHODS

The method for this study was both retrospective and prospective. Subjects for this study were recruited via simple random sampling. The eligible population of this study totalled 668. Subjects for the retrospective study numbered 324 and constitute menopausal women who came from settlements in Kaduna, Abia, Rivers and Osun State. While subjects for the prospective study was constituted by gravid women attending antenatal clinic in University of Port-Harcourt Teaching Hospital (UPTH), Cottage Hospital Port-Harcourt, General Hospital Funtua, Katsina State and Military Hospital Lagos. This group numbered 344.

Inclusion criteria for the retrospective aspect of this study were women who have attained natural menopause which is defined as having missed twelve (12) consecutive menstruations of which neither any drug, clinical or surgical procedure has induced (WHO, 1981). Women were included in prospective study if they have gestational age above four (4) weeks, without any co-existing clinical, obstetrics and gynaecological condition capable of inducing nausea and vomiting in pregnancy and if they are Nigerians without mixed race and have a pure breed for a particular ethnic group in Nigeria. This was determined by tracing their paternal origin up to the second generation. Information required was obtained through standardized questionnaires. Verbal interview of these women was the instrument of data collection to filling out the questionnaires via recall. For some others, questionnaires were distributed to these women to fill out either individually or in group. This study was carried out with due approval from an instituted ethical body and also with the consent of the participants themselves.

Data Analysis

Data were analysed using Analyse-It for Microsoft excel version 2.22,2011. Data were presented as descriptive statistics, percentages of Mean \pm SD. Ethnic incidence and general prevalence of NVP in the subjects was calculated and reported as percentages. Pearson's chi-square and student t-test was used where appropriate to compare means and calculate for association between nausea and vomiting of pregnancy and the demographic and reproductive characteristics. The level of significance was valued at $P < 0.05$ for all analysis

RESULTS

Represented on Table 1 is a descriptive statistic for women in the prospective study presented as Mean \pm Standard deviation. Within the study group, the mean age for gravid women was observed to be 29.60 ± 4.60 . On the reproductive characteristics of the gravid women, an earlier menarcheal age of 12.40 ± 2.30 was observed. Other parameters associated with gravidity which was also observed include their pregnancy weight and weight gain, mean systolic and diastolic blood and haemoglobin concentration.

The characteristics distributions of the gravid study population are represented on Table 2. Each variable under study for the study population differs within the study group with negligible difference in the proportion of women who reported NVP and those who did not.

The association between NVP and anthropometric (age, height, pregnancy weight, weight gain) and reproductive parameters (systolic and diastolic blood pressure and age at menarche) for gravid women with and without NVP are given in Table 3. Only menarcheal age associated significantly ($P < 0.05$) with NVP. There was no significant mean difference in the ages, height and diastolic blood pressure of gravid women with or without NVP. Although, women who suffered NVP had slightly lower weight, weight gain but higher systolic blood pressure (75.45 ± 13.29 ; 5.17 ± 3.57 and 111.40 ± 12.40 respectively) when compared to their counterpart who did not suffer NVP.

On table 4 is found the association between NVP and some socio-demographic and reproductive characteristics of the gravid women. All variables considered showed no significant association with NVP. Although, NVP was observed to decrease progressively with increase in parity. Nulliparous women reported the highest cases ($n = 80$) and the multiparous women (parity ≥ 4) had the least value ($n = 10$). So also did women with female fetuses report more incidence of NVP when compared to gravid women with male fetuses.

The menopausal women constitute the group for the retrospective study and have their descriptive characteristics presented on Table 5 and 6. Going by the season of birth, more women were born in the wet season than in the dry season. Also, 40.90% of menopausal women reported having suffered NVP in one or more pregnancy while 59.10% never had NVP during their reproductive age. It was also observed that more women had an early marriage, early child birth and more children when compared with women in the prospective study (gravid women). Women in this group had a later menarcheal age of 14.30 ± 1.70 and mean menopausal age of 45.50 ± 3.90 .

Table 7 represents the characteristics of the menopausal women. No significant difference was

observed in women with NVP by season of birth although more women born in the wet season reported NVP than those born in the dry season. A significant association ($P < 0.05$) was observed in the educational level of women and their report of NVP. The level of significance was observed between primary and secondary, primary and tertiary, other and secondary, other and tertiary but not between other and primary. Hence, primary and post-primary level of education was significant in the report of NVP. The parity of these women also showed association between the number of children and the report of NVP, although, no pattern was observed. All other variable considered for association with NVP were not significant, however, the proportion of women reporting for each variable varied.

Tables 8 and 9 also showed a significant association between NVP and age at menopause and the menstrual status of the study population. Women who did not suffer NVP had an early menopausal age (45.20 ± 4.10) as against women who had NVP (46.10 ± 3.40 ; $t = 2.18$, $P < 0.005$). Grouping the study population into pre-menopausal and menopausal group with the gravid women constituting the pre-menopausal, there was a significant increase in the report of NVP among the two groups such that women in the prospective study reported more cases of NVP when compared to menopausal women ($P < 0.05$). There was no association found between age at menarche and NVP.

Table 1: Descriptive statistics of anthropometric and reproductive characteristics of gravid women

| Parameters | n | Mean \pm SD | Minimum value | Maximum value | Range |
|--------------------------|-----|--------------------|---------------|---------------|-------|
| Ages (yrs) | 344 | 29.60 \pm 4.60 | 18.00 | 42.00 | 24.00 |
| Height (cm) | 340 | 162.69 \pm 7.11 | 106.20 | 188.00 | 81.80 |
| Age at menarche (yrs) | 341 | 12.40 \pm 2.30 | 10.00 | 18.00 | 8.00 |
| Pregnancy age (months) | 344 | 3.60 \pm 1.50 | 3.00 | 9.00 | 6.00 |
| Pregnancy weight (kg) | 344 | 76.32 \pm 13.45 | 50.00 | 121.00 | 71.00 |
| Weight gain (kg) | 323 | 5.20 \pm 3.67 | -10.00 | 20.50 | 30.50 |
| Systolic beat (mmHg) | 344 | 110.90 \pm 12.20 | 80.00 | 160.00 | 80.00 |
| Diastolic beat (mmHg) | 344 | 66.60 \pm 9.10 | 50.00 | 100.00 | 50.00 |
| HB concentration (gm/dl) | 344 | 10.91 \pm 2.05 | 6.00 | 35.00 | 29.00 |

HB-Haemoglobin concentration

Table 2: Descriptive statistics showing Socio- demographic characteristics of gravid women

| Parameters | Frequency (%) | n |
|--------------------------|---------------|-----|
| NVP | | |
| Yes | 164 (49.20) | 333 |
| No | 169 (50.80) | |
| Season of birth | | |
| Dry | 132 (41.40) | 319 |
| Wet | 187 (58.60) | |
| Ethnicity | | |
| Hausa | 44 (12.80) | 344 |
| Igbo | 130 (37.80) | |
| Yoruba | 109 (31.70) | |
| Others | 61 (17.70) | |
| Religion | | |
| Christian | 283 (84.70) | 334 |
| Muslim | 48 (14.40) | |
| Others | 3 (0.90) | |
| Educational level | | |
| Tertiary | 179 (53.90) | 332 |
| Secondary | 98 (29.50) | |
| Primary | 14 (4.20) | |
| Others | 37 (11.10) | |
| None | 4 (1.20) | |

| | | |
|-------------------|-------------|-----|
| Occupation | | |
| Working | 122 (36.30) | 336 |
| Student | 69 (20.50) | |
| Others | 62 (18.50) | |
| None-working | 83 (24.70) | |
| Income | | |
| ≤10,000 | 14 (4.70) | 300 |
| 11-20,000 | 31 (10.30) | |
| 21-30,000 | 45 (15.00) | |
| 31-40,000 | 59 (19.70) | |
| >40,000 | 151 (50.30) | |
| Parity | | |
| None | 158 (48.30) | 327 |
| 1 | 73 (22.30) | |
| 2 | 40 (12.20) | |
| 3 | 37 (11.30) | |
| ≥4 | 19 (5.80) | |

NVP- Nausea and vomiting of pregnancy

Table 3: Student's t-test for anthropometric and reproductive characteristics of gravid women

| Parameter | NVP Mean ± SD | Without NVP Mean ± SD | t | P |
|-----------------------|---------------------------|---------------------------|------|-------|
| Age (yrs) | 29.20 ± 4.50 (n=164) | 29.90 ± 4.50 (169) | 1.54 | 0.12 |
| Height (cm) | 162.65 ± 8.10 (n=161) | 162.71 ± 6.04 (n=168) | 0.07 | 0.94 |
| Pregnancy weight (kg) | 75.45 ± 13.29 (n=164) | 77.12 ± 13.71 (n=169) | 1.13 | 0.26 |
| Weight gain (kg) | 5.17 ± 3.57 (n=154) | 5.26 ± 3.79 (n=158) | 0.22 | 0.82 |
| Systolic BP (mmHg) | 111.40 ± 12.40 (n=164) | 110.70 ± 12.10 (n=169) | 0.54 | 0.59 |
| Diastolic BP (mmHg) | 66.60 ± 8.50 (n=164) | 66.90 ± 9.60 (n=169) | 0.61 | 0.54 |
| Hb conc. (gm/dl) | 10.88 ± 2.70 (n=159) | 10.92 ± 1.23 (n=166) | 0.13 | 0.90 |
| Menarche age (yrs) | 12.00 ± 2.20 (n=163) | 12.70 ± 2.40 (n=168) | 2.58 | 0.01* |

NVP- Nausea and vomiting of pregnancy; * P<0.05

Table 4: Chi-square (x²) test for association between NVP and socio-demographic characteristics of gravid women

| Parameter | NVP (Frequency) | Without NVP (Frequency) | n | X ² | P |
|--------------------------|--------------------|----------------------------|-----|----------------|------|
| Ethnicity | | | | | |
| Hausa | 15 | 28 | 333 | 4.71 | 0.19 |
| Igbo | 69 | 59 | | | |
| Yoruba | 53 | 53 | | | |
| Other | 27 | 29 | | | |
| Educational level | | | | | |
| Tertiary | 83 | 91 | 321 | 2.22 | 0.70 |
| Secondary | 50 | 44 | | | |
| Primary | 6 | 8 | | | |
| Other | 16 | 19 | | | |
| None | 3 | 1 | | | |

| | | | | | |
|------------------------|-----|-----|-----|------|------|
| Religion | | | | | |
| Christian | 137 | 136 | | | |
| Muslim | 18 | 29 | 323 | 2.54 | 0.28 |
| Other | 1 | 2 | | | |
| Occupation | | | | | |
| Working | 65 | 54 | | | |
| Student | 32 | 34 | 325 | 2.52 | 0.47 |
| Other | 26 | 34 | | | |
| Non-working | 37 | 43 | | | |
| Season of birth | | | | | |
| Dry | 62 | 64 | 308 | - | 0.28 |
| Wet | 89 | 93 | | | |
| Income (#) | | | | | |
| ≤10,000 | 5 | 8 | | | |
| 11-20,000 | 15 | 15 | | | |
| 21-30,000 | 28 | 15 | 291 | 5.03 | 0.28 |
| 31-40,000 | 31 | 26 | | | |
| >40,000 | 71 | 77 | | | |
| Parity | | | | | |
| None | 80 | 75 | | | |
| 1 | 35 | 37 | | | |
| 2 | 21 | 18 | 320 | 3.91 | 0.42 |
| 3 | 12 | 23 | | | |
| ≥4 | 10 | 9 | | | |
| Foetal sex | | | | | |
| Female | 63 | - | | | |
| Male | 33 | 1 | 97 | 1.87 | 0.17 |

NVP- Nausea and vomiting of pregnancy

Table 5: Descriptive statistics of demographic and reproductive characteristics of menopausal women

| Parameter | Frequency (%) | n |
|---------------------------------------|---------------|-----|
| Birth season | | |
| Dry | 102 (39.00) | 261 |
| Wet | 159 (61.00) | |
| Educational level | | |
| Tertiary | 45 (14.20) | 316 |
| Secondary | 84 (26.70) | |
| Primary | 57 (18.00) | |
| Others | 130 (41.10) | |
| Ethnicity | | |
| Hausa | 136 (42.00) | 324 |
| Igbo | 79 (24.40) | |
| Yoruba | 88 (27.20) | |
| Others | 21 (6.50) | |
| Religion | | |
| Christian | 166 (52.20) | 324 |
| Muslim | 152 (47.80) | |
| Handedness | | |
| Right | 297 (94.30) | 315 |
| Left | 18 (5.70) | |
| NVP | | |
| Yes | 128 (40.90) | 313 |
| No | 185 (59.10) | |
| Length of Menstrual flow(days) | | |
| ≤3 | | 313 |
| 4-5 | 101 (32.30) | |
| >5 | 176 (56.20) | |
| | 36 (11.50) | |

| | | |
|--|-------------|-----|
| Age at 1st birth (yrs) | | |
| <20 | 101 (34.00) | 297 |
| 20-25 | 107 (36.00) | |
| 26-30 | 80 (26.90) | |
| >30 | 9 (3.00) | |
| Breast feeding | | |
| Yes | 296 (99.00) | 299 |
| No | 3 (1.00) | |
| Parity | | |
| 1 | 9 (2.80) | 324 |
| 2 | 26 (8.00) | |
| 3 | 40 (12.30) | |
| ≥4 | 237 (73.20) | |
| None | 12 (3.70) | |
| Contraception | | |
| Yes | 68 (24.10) | 282 |
| No | 214 (75.90) | |

NVP- Nausea and vomiting of pregnancy

Table 6: Descriptive statistic of some reproductive characteristics of menopausal women

| Parameter | n | Mean ± SD | minimum | maximum | Range |
|------------------------|-----|--------------|---------|---------|-------|
| Age (Yrs) | 323 | 56.70 ± 8.90 | 40.00 | 110.00 | 70.00 |
| Age at menarche (yrs) | 321 | 14.30 ± 1.70 | 10.00 | 20.00 | 10.00 |
| Age at marriage | 324 | 19.60 ± 4.90 | 10.00 | 37.00 | 27.00 |
| Age at menopause (yrs) | 321 | 45.50 ± 3.90 | 30.00 | 57.00 | 27.00 |

Table 7: Chi-square (χ^2) test for association between NVP and demographic and reproductive characteristics of menopausal women

| Parameter | NVP (Frequency) | Without NVP (Frequency) | n | χ^2 | P |
|---------------------------------|--------------------|-------------------------------|-----|----------|---------|
| Birth season | | | | | |
| Dry | 43 | 58 | 252 | 0.12 | 0.73 |
| Wet | 61 | 90 | | | |
| Educational level | | | | | |
| Tertiary | 25 | 20 | 305 | 13.44 | 0.0002* |
| Secondary | 43 | 40 | | | |
| Primary | 15 | 40 | | | |
| Others | 42 | 80 | | | |
| Ethnicity | | | | | |
| Hausa | 42 | 86 | 313 | 6.79 | 0.08 |
| Igbo | 36 | 43 | | | |
| Yoruba | 42 | 43 | | | |
| Others | 8 | 13 | | | |
| Religion | | | | | |
| Christian | 75 | 88 | 307 | 3.55 | 0.06 |
| Muslim | 51 | 93 | | | |
| Handedness | | | | | |
| Right | 116 | 172 | 305 | 0.01 | 0.94 |
| left | 7 | 10 | | | |
| Length of menstrual flow | | | | | |
| ≤3days | 44 | 52 | 303 | 4.84 | 0.09 |
| 4-5days | 62 | 111 | | | |
| >5days | 18 | 18 | | | |

| | | | | | |
|--|----|-----|-----|-------|-------|
| Age at 1st birth (yrs) | | | | | |
| <20 | 37 | 63 | | | |
| 20-25 | 38 | 67 | 292 | 6.72 | 0.08 |
| 26-30 | 41 | 37 | | | |
| >30 | 5 | 4 | | | |
| Parity | | | | | |
| 1 | 4 | 1 | | | |
| 2 | 17 | 9 | | | |
| 3 | 16 | 21 | 313 | 11.19 | 0.02* |
| ≥4 | 91 | 144 | | | |
| None | - | 6 | | | |

NVP- Nausea and vomiting of pregnancy;* P<0.05

Table 8: Student's t-test for association between NVP and some reproductive characteristics of menopausal women

| Parameter | NVP Mean ± SD | Without NVP Mean ± SD | t | P |
|-------------------------|-------------------------|-----------------------------|------|-------|
| Menarche | 14.3 ± 1.70 (n=125) | 14.30 ± 1.70 (n=185) | 0.02 | 0.98 |
| Age at Menopause | 46.10 ± 3.40 (n=127) | 45.20 ± 4.10 (n=183) | 2.18 | 0.02* |

NVP- Nausea and vomiting of pregnancy;* P<0.05

Table 9: Comparative analysis of menstrual status of subjects

| Parameter | Frequency (%) | NVP | Without NVP | χ^2 | P |
|-------------------------|---------------|-----|-------------|----------|-------|
| Menstrual status | | | | | |
| Pre-menopausal | 333 (51.50) | 164 | 169 | 4.55 | 0.03* |
| Menopausal | 313 (48.50) | 128 | 185 | | |

NVP- Nausea and vomiting of pregnancy;* P<0.05

DISCUSSION

NVP and anthropometric characteristics

Results for anthropometric characteristics (such as age, height, pregnancy weight, weight gain) and other parameters as blood pressure and haemoglobin concentration from this study found no association with incidence of NVP among pregnant women. The non significant association with age which is contrary to other works [15, 16] that found an association between younger women and NVP may not be unconnected to the fact that the population under study may be of the same age range on the average. However, a lower weight (75.45kg) was observed in women who suffered NVP than those who did not (77.12 kg). This is in agreement with the works of Vilming *et al.* [13] and Linseth *et al.* [17] who observed a smaller weight gain in women who suffered NVP. Also, the lack of association between weight gain and NVP makes it unlikely that weight can be associated with NVP rather, the reduction in weight could have resulted from food aversion, nutritional loss and dehydration from excessive vomiting other than the cause itself hence, no association [4, 8].

NVP and reproductive characteristics

Age at menarche was observed to be significantly (P < 0.05) associated with nausea and vomiting of

pregnancy in the prospective aspect of this study which constitute gravid women but not with the menopausal women who were subjects for the retrospective study. The trend was such that women who had early menarche suffered NVP. Supporting this finding is the psychological theory of Ringler *et al.* [18] who said that NVP was associated to lack of preparedness for motherhood, meaning that women who attained early menarche most likely develop faster and have a higher probability of getting married before they were psychologically and emotionally prepared. Also, the role of the environment cannot be completely ruled out as industrialization and development has contributed negatively by increasing the amount of toxins and pollutants in the environment. Considering also the number of years between menarcheal age and the ages of these menopausal women, it may not be wrong to assume that there could be errors in their recall of the age at menarche hence, the difference.

For association between parity and NVP, this study presents two contradicting results. A significant association between parity and NVP was observed in the retrospective group such that the report of NVP among women increased with increased parity as multiparous women had the highest occurrence. This was consistent with several other works [2, 17, 19]. On

the other hand, data collected for the prospective study, though not significant reports a decrease in NVP with increase in parity in that multiparous women had a lower incidence of reporting NVP which is in line with other published literatures [16, 20]. This observed difference may not be unconnected to genetic involvement in this condition which according to Golberg *et al.* [21], Cedergren *et al.* [22] and Sandven *et al.* [23] is transmitted by mother but caused by shared environmental factors. Moreso, unavailability of the medical records for the women who constitute the retrospective study to ascertain if the NVP condition was caused by other factors other than being pregnancy induced cannot be completely ruled out. Foetal sex in this study was also consistent with other studies [20, 24] that reported that NVP was associated with female fetuses. There was however, no significant association observed between length of menstrual flow and age at first childbirth. Although, women whose menstrual flow lasted for 4-5 days and had an early childbirth are more likely to suffer NVP with the highest found among women between 26-30 years as also reported by Gadsby *et al.* [16].

This study also found a significant association ($P = 0.02$) between age at menopause and vomiting of pregnancy. Women who suffer NVP had a later menopausal age of about a year. High and sustained level of the female sex hormones which has been hypothesized by several studies [1, 25-27] as aetiology of NVP could be responsible. Conclusions drawn from this indicate that women with NVP are probably more fertile and have a longer reproductive period.

NVP and socio-demographic factors

Apart from educational level of women in the retrospective group which significantly associated with NVP, ethnicity, educational level, religion, occupation, season of birth, household income showed no significant association with NVP in this study. Going by the two seasons of birth, women who were born in the wet season reported more cases of NVP than those born in dry season. More so, the Igbo and Yoruba women had higher incidence of NVP in the prospective study but not in the retrospective as women from Hausa and Yoruba reported more. This may have been influenced by the sample size for the ethnic groups in each study. Christians had more incidence than their Muslim counterpart. Working women also reported more cases and this could be linked to their educational level and hence, their income and lifestyle. A linear relationship was observed between household income and report of NVP and consistent with previous studies [28, 29]. The lack of statistical significance for these variables is likely related to inadequate statistical power as a result of small of the sample sizes.

Menstrual status and incidence / prevalence of NVP

For the purpose of testing one of the hypotheses of this study, participants were grouped into two by

menstrual status; the pre-menopausal women constituted by gravid women from the prospective study and menopausal women from the retrospective group. Data analysis for this study showed a significance increase ($P = 0.003$) of about 3% in NVP among pregnant women in recent times and this might be linked choice of diet and the environment as reported by other studies [7, 8, 30].

Ethnic differences in the incidence of NVP were also observed from both studies. Igbo women had the highest incidence rate of 53.91% in the prospective study, with the least observed among the Hausa women, 34.80%. These were generally higher with what was observed from the retrospective study. Further to this, Minturn and Weiher [31], Mitzi and Pepper and Roberts [32] provided evidence of little or no nausea and vomiting of pregnancy in population groups relying on grain and fruit diets rather than on meat and vegetables. This is typical for the Nigerian population, although diet varies from one ethnic group to another thus, explaining the varying incidence observed between the ethnic groups. However, the incidence for the Nigerian population is lower than that reported for the population of developed countries [1, 16]. A high prevalence rate of 43.71% (i.e. 437/1000) was observed among the study population.

CONCLUSION

Mild degree of nausea and vomiting of pregnancy is a phenomenon which has now been accepted as a normal part of pregnancy. Its aetiology remains unknown and has been the focus of several studies. This study suggests NVP as a condition whose aetiology multi-factorial; an interplay between genetic predisposition and environmental factors.

REFERENCES

1. Verberg MF, Gillott DJ, Al-Fardan N, Grudzinskas JG; Hyperemesis gravidarum, a literature review. *Human Reproductive Update*, 2005; 11:527-539.
2. Lacasse A, Rey E, Ferreira E, Morin C, Bérard A; Epidemiology of nausea and vomiting of pregnancy: prevalence, severity, determinants and the importance of race/ethnicity. *BMC Pregnancy and Childbirth*, 2009; 9:26.
3. Broussard CN, Richter JE; Nausea and vomiting of pregnancy. *Gastroenterology Clinics*, 1998; 27:1.
4. Sherman PW, Flaxman SM; Nausea and vomiting of pregnancy in an evolutionary perspective. *American Journal of Obstetrics and Gynaecology*, 2002; 186(5 suppl): S190-S197.
5. Tierson FD; Pregnancy, dietary cravings and aversions. *Encyclopedia of Human Biology*. 2nd edition, Academic Press, 1997; 57-59.
6. Bennett TA, Kotelchuck M, Cox CE, Tucker MJ, Nadeau DA; Pregnancy-associated hospitalizations in the United States in 1991 and 1992: a comprehensive view of maternal morbidity. *American Journal of Obstetrics and Gynaecology*, 1998; 178: 346-354.

7. Richard VL; Nausea and vomiting of pregnancy: An evolutionary hypothesis. *Revista médica de Chile*, 2002; 130(5): 580-584.
8. Profet M; Pregnancy sickness as adaptation: A deterrent to maternal ingestion of teratogens. In Barkow JH, Cosmides L, Tooby J editors; *The Adapted Mind. Evolutionary Psychology and the Generation of Culture*. New York, Oxford University Press, 1992: 327-365.
9. Jordan V, MacDonald J, Crichton S, Stone P, Ford H; The incidence of hyperemesis gravidarum is increased among Pacific Islanders living in Wellington. *The New Zealand Medical Journal*, 1995; 105: 342-344.
10. Burchard EG, Ziv E, Coyle N, Gomez SL, Tang H, Karter AJ; The importance of race and ethnic background in biomedical research and clinical practice. *New England Journal of Medicine*, 2003; 348:1170-1175.
11. Klebanoff MA, Koslowe PA, Kaslow R, Rhoads GG; Epidemiology of vomiting in early pregnancy. *Obstetrics and Gynaecology*, 1985; 66: 612–616.
12. Louik C, Hernandez-Diaz S, Werler MM, Mitchell AA; Nausea and vomiting in pregnancy: maternal characteristics and risk factors. *Paediatrics and Perinatal Epidemiology*, 2006; 20: 270-278.
13. Vilming B, Nesheim BI; Hyperemesis in a contemporary population in Oslo. *Acta Obstetrica et Gynecologica Scandinavica*, 2000; 79: 640-643.
14. Vikanes A, Skjærven R, Grjibovski AM, Gunnes N, Vangen S, Magnus P; Recurrence of hyperemesis across generations: population based cohort study. *British Medical Journal*, 2010; 340: c2050.
15. Vikanes AV, Grjibovski A, Vangen S, Magnus P; Length of residence and the risk of developing hyperemesis gravidarum amongst first generation immigrants to Norway. *European Journal of Public Health*, 2008;18: 460-465.
16. Gadsby R, Barnie-Adshead AM, Jagger C; A prospective study of nausea and vomiting during pregnancy. *British Journal of General Practitioners*, 2003; 43: 245-248.
17. Linseth G, Vari P (2005). Nausea and vomiting in pregnancy. *Health Care Women International*, 26:372-386.
18. Ringler M, Krizmanits A; Psychosomatic aspects of emesis gravidarum: somatic and psychosocial status of females in early pregnancy. *Z Geburtshilfe Perinatolo*, 1984; 188: 234–238.
19. Kallen B, Lundberg G, Aberg A; Relationship between vitamin use, smoking and nausea and vomiting of pregnancy. *Acta Obstetrica Gynecologica Scandinavica*, 2003; 82: 916-920.
20. Schiff MA, Reed SD, Daling JR; *The sex ratio of pregnancies complicated by hospitalisation for hyperemesis gravidarum*. *BJOG: An International Journal of Obstetrics and Gynaecology*, 2004; 111: 27-30.
21. Golberg D, Szilagyi A, Graves L; *Hyperemesis gravidarum and Helicobacter pylori infection: a systematic review*. *Obstetrics and Gynaecology*, 2007; 110: 695-703.
22. Cedergren M, Brynhildsen J, Josefsson A, Sydsjo A, Sydsjo G; Hyperemesis gravidarum that requires hospitalization and the use of antiemetic drugs in relation to maternal body composition. *American Journal of Obstetrics and Gynaecology*, 2008; 198: 412-415.
23. Sandven I, Abdelnoor M, Nesheim BI, Melby KK; *Helicobacter pylori infection and hyperemesis gravidarum: a systematic review and meta-analysis of case-control studies*. *Acta Obstetrica et Gynecologica Scandinavica*, 2009; 88: 1190-1200.
24. Tan PC, Jacob R, Quack KF, Omar SZ; The foetal sex ratio and metabolic, biochemical, haematological and clinical indicators of severity of hyperemesis gravidarum. *BJOG: An International Journal of Obstetrics and Gynaecology*, 2006; 113: 733-737.
25. Goodwin TM, Montoro S, Mestman JH; The role of chorionic gonadotropin in transient hyperthyroidism of hyperemesis gravidarum. *Journal of Clinical Endocrinology and Metabolism*, 1992; 75: 1333-1337.
26. O'Brien B, Zhou Q; Variables related to nausea and vomiting during pregnancy. *Birth*, 1995; 22: 93-100.
27. Kallen B; Hyperemesis gravidarum during pregnancy and delivery outcome: A registry study. In Koren G, Bishai R editors; *Nausea and Vomiting of Pregnancy: State of the Art*. Toronto: Motherisk, the Hospital for Sick Children, 2000: 36-40.
28. Lacroix R, Eason E, Melzack R; Nausea and vomiting during pregnancy: A prospective study of its frequency, intensity and patterns of change. *American Journal of Obstetrics and Gynaecology*, 2000; 182: 931-937.
29. Karaca C, Guler N, Yazar A, Camlica H, Demir K, Yildirim G; Is lower socio-economic status a risk factor for Helicobacter pylori infection in pregnant women with hyperemesis gravidarum? *Turkish Journal of Gastroenterology*, 2004; 15: 86–89.
30. Kouzi S; Nausea and Vomiting of Pregnancy. *American Journal of Pharmaceutical Education*, 2003; 67(2): 66.
31. Minturn L, Weiher A; The influence of diet on morning sickness: a cross culture study. *Medical Anthropology*, 1984; 8:71-75.
32. Pepper GV, Roberts SC; Rates of nausea and vomiting in pregnancy and dietary characteristics across populations. *Proceedings of the Royal Society of Biological Sciences*, 2006; 273: 2675-2679.