Effect of nutritional counseling on body mass index of adult hypertensive attending general outpatient clinic, federal medical center, Ido-Ekiti South-Western Nigeria

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ABSTRACT

Background: Achieving target blood pressure (BP) control has become an important management challenge, as the prevalence of hypertension increases in adult Nigerians. Overweight/obesity and lack of lifestyle behaviors are associated with difficulty in achieving target BP control. This study aim at determine the effect of nutritional counseling on body mass index (BMI) of adult hypertensive attending general outpatient clinic.

Materials and Methods: An interventional study was performed on 322 adult patients (161 in the intervention group and 161 in the control group) with hypertension who had been on treatment for at least 3 months. Relevant data were collected using interviewer-administered the semi-structured questionnaire and clinical parameters were measured pre- and post-intervention. The intervention group was given nutritional counseling.

Results: The mean BMI in the intervention group decreased to a statistically significant level (P < 0.001), from 25.42 ± 3.99 to 24.89 ± 3.64 compared to an increase in the control group from 25.36 ± 3.73 to 25.39 ± 3.74. The mean change in BMI of the intervention group (−0.53 ± 0.59) was higher than the mean change in BMI of the control group (0.03 ± 0.45), which was statistically significant (P < 0.001). More than two-thirds of the intervention group 135 (83.9%) had good BP control, compared to 68 (42.2%) of the control group.

Conclusion: The nutritional status of the respondents in the intervention group is better than in the control group at the end of the study. Improved nutritional status led to better BMI. Family physicians will do well to counsel hypertensive patients on nutritional and lifestyle behavior with a view to improving BP control in them.

Keywords: Body mass index, hypertensive, nutritional counseling

Introduction

Noncommunicable diseases (NCDs), particularly cardiovascular diseases, diabetes mellitus, cancer and respiratory diseases are the major causes of morbidity and mortality in the developed world and are emerging as an important component of the burden of disease in developing countries like Nigeria.¹ NCDs are diseases that are associated with genetic predisposition and related to lifestyle with multifactorial environmental influences.² In Nigeria, hypertension ranks first among the NCDs with high prevalence in reported series.² In general, hypertension prevalence was higher in urban areas and this may indicate differences in lifestyle as
urban populations are more likely to eat processed foods which are high in salt and fat content. Obesity which is a risk factor for hypertension is also higher in urban areas than in rural areas because of reduced physical activity. Ordinioha in a community study in Port Harcourt found the prevalence of hypertension to be 21.33%. The prevalence of hypertension in a rural community in Edo State was found to be 20.2% by Omuemu et al., Asekun-Olarinmoye et al., in a study in Osun State, southwestern Nigeria found the prevalence of hypertension to be 13.16%. Hypertension is a main risk factor for stroke and coronary heart disease. It is a major contributor to the onset and progression of chronic heart and kidney failure. The relationship between blood pressure (BP) and the risk of cardiovascular events is continuous, consistent, and independent of other risk factors.

Obesity is a major risk factor for hypertension and has a complex etiology. It is influenced by genetic, metabolic, and environmental factors. Overweight and obesity are currently recognized as major public health issues in most areas of the world.

The burden of obesity in hypertension is enormous and weight reduction is advocated in the management. The prevalence of obesity increased in all ages, genders, and ethnic/racial groups during the past three decades being most prevalent in Hispanic males (27.5%) and African-American females (26.6%), adolescent and young adults. In Nigeria, among the general population, the prevalence range of being overweight was 20.3%–35.1%, whereas the prevalence range of obesity was 8.1%–22.2%. Ibhazehiebo et al. in a study found the prevalence of hypertension among the obese young adults to be 12%, however, Akinunde et al. reported 25.6%. Thus, the prevalence of overweight and obesity among patients with hypertension in Nigeria is presently high.

Although there is wealth of evidence regarding the benefits of a healthy lifestyle, available data suggest that adherence to lifestyle recommendations among hypertensive patients is poor; also medication is often prescribed with little attention to lifestyle modification, despite evidence that suggests that adopting healthy behaviors can add to the protective benefit of medication.

Thus, it is essential that lifestyle modification and nondrug treatment measures such as health education, reduction in weight through regular exercise, changing in eating patterns, cessation of tobacco, and reduction of alcohol intake should be emphasized and intensified in the management of hypertension by primary care physicians.

Many hypertension studies are frequently focused on only the pharmacological interventions; however, nutritional and lifestyle behavioral changes are the cornerstone to the management of hypertension. The studies on the effect of nutritional behavioral changes counseling on BP control are scanty in Nigeria. Hence, this study aimed at determining effect of nutritional and lifestyle counseling on body mass index (BMI) of adult hypertensive patients.

**Materials and Methods**

The study was hospital-based interventional study and was conducted over a period of 20 weeks.

Sample size was determined using the formula:

\[ n' = 2z^2pq/d^2 \]

where:
- \( n' \) = Sample size per group. \( (n' = n_1 = n_2) \)
- \( n_1 \) = Sample size for the intervention group
- \( n_2 \) = Sample size for the control group
- \( z \) = Standard normal deviate set at 1.96 at 95% confidence level
- \( p \) = Proportion in the target population estimated to have a particular characteristic
- \( d \) = Desired level of precision, with observed difference of 0.10 significance at the 0.05 level.

\[ q = 1 - p. \]

The minimum sample size was 141. However, to allow for unexpected data losses and drop-outs during recruitment, a sample size of 161 per group was used for the study.

Simple random and systematic random sampling techniques were used to recruit subjects among hypertensive patients attending the clinic. The first participant was selected by simple random sampling, 2 small papers were marked YES and NO. The first two patients in the waiting area who gave consent to participate in the study were asked to pick the paper, and the patient that picked the YES was the first for that day and then every second patient was selected by systematic random sampling. This was repeated every clinic day until the sample size was met.

Patients were allocated into two groups (control and intervention) by randomization. The intervention and
control group were randomized by having opaque envelopes numbered serially with cards which indicated whether a patient should be in intervention or control. They were matched for sociodemographic characteristics. The matching was achieved by subjecting the two groups to statistical analysis which shows the difference between the two groups was not statistically significant.

Inclusion criteria include hypertensive aged ≥30 years and ≤80 years, who have been on treatment for at least 3 consecutive months. Excluded from the study were critically ill, psychiatric, and pregnant women.

Ethical clearance was obtained from the Ethical Review and Research committee of the institution. Informed verbal and written consent were also obtained from willing participants.

The study was done in two phases.

Phase 1 was the first contact with the patient when the sociodemographic data and clinical parameters such as weight, height, and BP were taken, and (baseline) questionnaire administered to assess lifestyle behavior for both the control and intervention groups. Counseling on nutritional and lifestyle behaviors was undertaken for the intervention by the principal investigator. Each counseling session for each participants lasted about 30–45 min. Each session started with an open-ended interrogative communication using lay language. The author provided clear and thorough information and adequate time was allowed for respondents questions. The participants had one session of counseling. However, there were reinforcements of the counseling through reminders to the participants every 2 weeks for a period of 12 weeks after phase 1. This was achieved with phone calls and short message services.

Phase 2 commenced 12 weeks after phase 1 and this phase involved re-administration of questionnaire to assess nutritional behavioral changes. The post-intervention data collection was carried out in both the intervention and control groups 3 months after the intervention.

Pre-tested semi-structured interviewer-administered questionnaire was used. The questionnaire was used to obtain relevant information on sociodemographic variables such as age, sex, marital status, religion, tribe, occupation, educational status (section A). Weight, height, and BP were measured (while the BMI was calculated using the computer) to complete the clinical data (section B). BMI is an acceptable index for estimating the nutritional status of a population. The third component of the questionnaire (section C) assessed lifestyle behavior of the participants.

Three research assistants who are namely; a resident doctor, a nurse and a health information officer were used.

Stadiometer – Surgifield Sm-160, England calibrated in meters was used to measure the height of subjects. Measurements were taken to the nearest 0.01 m.

Hanson’s bathroom weighing scale, England, was used to measure in kilograms the weight of all participants to the nearest single decimal place. The scale was regularly adjusted to correct for zero error at the beginning of each day and after each patient.

An Accosson® brand Mercury Sphygmomanometer made in England with appropriate cuff and stethoscope was used to measure the BP of the patients in the sitting position using the left arm.

All data collected was analyzed, using the Statistical Package for Social Sciences for Windows software version 17.0 (SPSS Inc., Chicago IL, USA). Two-stage analysis was performed; analysis of the pre-intervention and post-intervention questionnaire. Frequency tables were generated for relevant variables. Means, standard deviations (SD), and percentages were determined as appropriate. The means and SD were calculated for continuous variables, whereas categorical variables were analyzed using proportions. Test of significance was carried out using the Student’s t-test. The Student’s t-test was used to compare the means when there were only 2 means to compare. P ≤ 0.05 was taken to be statistically significant.

Results

The mean age SD of the respondents was 60.9 ± 10.2; the age group 50–59 had the highest numbers of respondents (34.2%), whereas age group 40–49 had the least numbers of respondents (13.0%). There were more females (50.6%) among the respondents. Table 1 showed that the sociodemographic characteristics of the intervention and control group were similar. There was no statistically significant difference in the age, gender, marital status, religion, and ethnicity of the respondents. Table 2 shows the mean BMI of the intervention group was 25.42 ± 3.99, whereas the mean BMI of the control group was 25.36 ± 3.73. However, the mean weight and
the mean BMI of the intervention and control groups were not statistically significant \((P = 0.632, 0.885, \text{ respectively})\). Table 3 shows marginal difference in the mean weight and the mean BMI of the intervention group and control group postintervention (68.8 ± 11.4 and 24.89 ± 3.64 vs. 69.8 ± 11.7 and 25.39 ± 3.74). However, these differences were not statistically significant \((P = 0.459, 0.222)\). Table 4 shows that the mean change in weight of the intervention group was −1.52 ± 1.7, whereas the mean change in weight of the control group was 0.1 ± 1.2. The mean change in BMI of the intervention group (−0.53 ± 0.59) was higher than the mean change in BMI of the control group (0.03 ± 0.45). The differences were statistically significant, \(P < 0.001\). Table 5 shows that the mean weight of the respondents in the intervention group decreased from 70.3 to 68.8 and BMI decreased from 25.42 to 24.89 in the intervention group (difference of 1.5 and 0.53), whereas in the control group, difference was −0.1 and −0.03. The difference in mean weight and BMI was significant in the intervention group, \(P < 0.001\), but not in the control group, \(P = 0.378\) and \(P = 0.373\) after the intervention.

**Discussion**

The mean BMI was 25.42 ± 3.99 and 25.36 ± 3.73 in the intervention and control group, respectively, before the intervention. This was lower than mean BMI of 26.05 ± 5.03 among the market population in Enugu, Nigeria.\(^{[19]}\) The difference may be as a result of the difference in study location. Ours is at a rural tertiary hospital setting which may be a reflection of the study population as oppose to the sedentary lifestyle of the market people most of whom sit in one place to conduct their businesses in Enugu study. It was also lower than 30.15 ± 0.3 and 29.45 ± 0.1 for the intervention and control group of the Bjorknas study.\(^{[20]}\) The lower BMI in our study may be because of the difference in life style (less eating of refining food etc.).

Meanwhile, a cross-sectional study in the same geopolitical zone reported 25.54 ± 4.96 and 27.63 ± 5.96 for male

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**Table 1: Sociodemographic characteristics of respondents**

| Variables          | Intervention group \((n=161), \text{ n (\%)})\ | Control group \((n=161), \text{ n (\%)})\ | \(\chi^2\) | Df | \(P\) |
|--------------------|-----------------------------------------------|---------------------------------------------|------------|----|------|
| Age (years)        |                                              |                                             |            |    |      |
| Mean±SD* (minimum-maximum) | 61.3±9.7 (40-87) | 60.5±10.3 (40-84) | 0.715 | 320 | 0.475 |
| 40-49              | 18 (11.2)                                    | 24 (14.9)                                   | 1.570      | 3  | 0.666 |
| 50-59              | 58 (36.0)                                    | 52 (32.3)                                   |            |    |      |
| 60-69              | 51 (31.7)                                    | 47 (29.2)                                   |            |    |      |
| 70+                | 34 (21.1)                                    | 38 (23.6)                                   |            |    |      |
| Sex                |                                              |                                             |            |    |      |
| Male               | 76 (47.2)                                    | 83 (51.6)                                   | 0.609      | 1  | 0.435 |
| Female             | 85 (52.8)                                    | 78 (48.4)                                   |            |    |      |
| Marital status     |                                              |                                             |            |    |      |
| Single             | 4 (2.5)                                      | 1 (0.6)                                     | 0.197**    |    |      |
| Married            | 128 (79.5)                                   | 141 (87.6)                                  |            |    |      |
| Divorced           | 12 (7.4)                                     | 9 (5.6)                                     |            |    |      |
| Widowed            | 17 (10.6)                                    | 10 (6.2)                                    |            |    |      |
| Religion           |                                              |                                             |            |    |      |
| Christianity       | 131 (81.4)                                   | 136 (84.5)                                  | 0.347**    |    |      |
| Islam              | 24 (14.9)                                    | 23 (14.3)                                   |            |    |      |
| Traditional        | 6 (3.7)                                      | 2 (1.2)                                     |            |    |      |
| Ethnicity          |                                              |                                             |            |    |      |
| Yoruba             | 140 (87.0)                                   | 146 (90.7)                                  | 0.295**    |    |      |
| Ibo                | 13 (8.0)                                     | 12 (7.4)                                    |            |    |      |
| Hausa              | 8 (5.0)                                      | 3 (1.9)                                     |            |    |      |

*Independent samples t-test applied, **Fisher’s exact test applied. SD - Standard deviation, n - Frequency

**Table 2: Pattern of nutritional status of respondents preintervention**

| Variables          | Intervention group \((n=161)\) | Control group \((n=161)\) | \(t\)  | df | \(P\) |
|--------------------|---------------------------------|---------------------------|--------|----|------|
| Weight (kg)        | 70.3±12.6                       | 69.7±11.6                 | 0.479  | 320 | 0.632 |
| BMI (kg/m²)        | 25.42±3.99                      | 25.36±3.73                | 0.145  | 320 | 0.885 |

BMI - Body mass index

**Table 3: Pattern of nutritional status of respondents postintervention**

| Variables          | Intervention group \((n=161)\) | Control group \((n=161)\) | \(t\)  | df | \(P\) |
|--------------------|---------------------------------|---------------------------|--------|----|------|
| Weight (kg)        | 68.8±11.4                       | 68.9±11.7                 | −0.741 | 320 | 0.459 |
| BMI (kg/m²)        | 24.89±3.64                      | 25.39±3.74                | −1.224 | 320 | 0.222 |

BMI - Body mass index
and female, respectively. This may underscore the fact that obesity is more common among females than males because females are more prone to gluteofemoral lipogenesis and fat deposition causing increased frequency of obesity among them.

The prevalence of obesity in this study, 15.5% for intervention and 12.4% for the control group was <23.3% found in a cross-sectional study in the same geopolitical zone. The difference is likely due to the difference in social status, and economic class of the people in the places studied, suggesting there is a geographic distribution in the pattern of nutritional status in patients with essential hypertension across Nigeria. It was also <24% among a study population in Israel, and 57% obese reported in Kuwait. Cultural difference and socioeconomic developments may account for the difference. For instance, Kuwait had rapid growth and socioeconomic developments post-oil discovery, unlike Nigeria where poverty still ravages the citizens.

In this study, the proportion of nonobese and obese participants in the intervention group changed from 84.5% and 15.5% to 91.3% and 8.7%. This agreed with a study in Lagos by Busari et al., that showed slight improvement in BMI of the respondents after the intervention, with the proportion of overweight and obese participants reducing from 23.5% to 12% pre-intervention to 18.5%, and 10% at post-intervention.

It was found in this study that the difference between nutritional status, BMI, of the intervention and control group was not significant before the intervention, but counseling intervention decreased the mean weight and BMI in the intervention group. This study showed a mean change in weight of $-1.52 \pm 1.7 (-6.0\text{–}2.0)$ and $0.1 \pm 1.2 (-3.0\text{–}1.5)$ for intervention and control group; mean change in BMI of $-0.53 \pm 0.59 (-2.50\text{–}0.78)$ and $0.03 \pm 0.45 (-1.04\text{–}4.11)$. These changes were statistically significant, $P < 0.001$. This was in concordance with the Bjorkna's study conducted in Sweden which had significant differences between the intervention and control groups' mean changes (and their 95% confidence intervals, in waist circumference $-1.9 \text{ cm (−2.80} \text{–}−0.90; P < 0.001$ and in waist-hip ratio $-0.01 (−0.02\text{–}−0.004; P < 0.01$).

Although this randomized control trial was followed up for 1 year and the variable outcomes measured were different, the similarity in the results means short period intervention with reinforcements could achieve a positive effect on nutritional status.

The pre-intervention mean systolic BP (SBP) in the intervention and control group was $144.8 \pm 11.5$ and $145.9 \pm 11.5$, respectively, whereas the mean diastolic BP (DBP) was $86.4 \pm 7.7$ and $87.4 \pm 7.6$ in the intervention and control group, respectively. The post-intervention showed that mean SBP in the intervention and control group was $130.9 \pm 10.9$ and $145.6 \pm 11.3$, respectively, while the mean DBP was $79.1 \pm 7.7$ and $86.5 \pm 7.0$, respectively. The intervention program reported here resulted in significant improvement in nutritional status, which is the likely reason for better BP control in the intervention group, because antihypertensive medications were not altered.

### Conclusion

Nutritional counseling resulted in improved nutritional status as evidenced by reduced BMI in the intervention

### Table 4: Mean changes in weight and body mass index of respondents postintervention

| Variables          | Intervention group | Control group | Z    | P     |
|--------------------|--------------------|---------------|------|-------|
| Weight (kg)        |                    |               |      |       |
| Mean change (range)| $-1.52\pm1.7 (6.0\text{–}2.0)$ | $0.1\pm1.2 (-3.0\text{–}1.5)$ | $-9.792$ | $<0.001$ |
| BMI (kg/m$^2$)     |                    |               |      |       |
| Mean change (range)| $-0.53\pm0.59 (-2.50\text{–}0.78)$ | $0.03\pm0.45 (-1.04\text{–}4.11)$ | $-9.792$ | $<0.001$ |

BMI - Body mass index, Z – Mann-Whitney U-test

### Table 5: The intra-group difference in nutritional status of the respondents

| Variables          | Preintervention | Postintervention | Paired samples t-test |
|--------------------|-----------------|------------------|-----------------------|
| Intervention group |                 |                  |                       |
| Mean weight (kg)   | $70.3\pm12.6$   | $68.8\pm11.4$   | $11.541, 160, <0.0001$|
| Mean BMI (kg/m$^2$)| $25.42\pm3.99$  | $24.89\pm3.64$  | $11.532, 160, <0.0001$|
| Control group      |                 |                  |                       |
| Mean weight (kg)   | $69.7\pm11.6$   | $69.8\pm11.7$   | $-0.883, 160, 0.378$  |
| Mean BMI (kg/m$^2$)| $25.36\pm3.73$  | $25.39\pm3.74$  | $-0.894, 160, 0.373$  |

BMI - Body mass index
group. This ultimately resulted in better BP control. This shows that nonpharmacologic management of hypertension is as important as pharmacologic management.

**Limitations**

This study only controlled for sociodemographic characteristics, but not for other variables like therapy-related factors (medication cost and complexity of regimen). The intervention was short due to time constraints. Hence, long duration research should be of a longer duration to determine the effect of nutritional counseling on BP is suggested.

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**Conflicts of interest**

There are no conflicts of interest.

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