Original Research Article

Changes in lipid profile and some biochemical parameters in postmenopausal women treated with honey

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A R T I C L E   I N F O

A B S T R A C T

The study investigated the effect of natural honey on the lipid profile and some biochemical parameters among postmenopausal women, aged 45-65 years old. Sixty healthy postmenopausal women were given 20 g/day of natural honey and followed up for three months. The primary outcome was changes from baseline on the lipid profile and the chosen biochemical parameters (fasting blood sugar, serum calcium) and some anthropometric parameters. Paired t-test was performed to evaluate the difference between the baseline and the 3 month values of the parameters and lipid profiles. Sixty postmenopausal women successfully completed the study. The result showed that there were significant increases in HDL-C, calcium and significant decreases in LDL-C, TG, TC, and FBS concentrations in the blood of the research subjects after three months of treatment with honey compared with the values at baseline ($p<0.05$). Also there were significant decreases in the blood pressure, weight and waist circumference of the postmenopausal women after treatment when compared with baseline values ($p<0.05$). Natural honey helps in improving the lipid profile, FBS, Blood pressure, weights and waist circumference of postmenopausal women and can be included as part or alternative remedies in management of postmenopausal conditions.

1. Introduction

Menopause is that period in a woman's life when she has not bled for an entire year.[1] This period or stage is characterized by many menopausal symptoms such as night sweats, hot flashes, vaginal dryness, insomnia, osteoporosis, depression, headache and various other cardiovascular diseases as a result of reduced estrogen.[2–4] Postmenopause begins when a woman officially reached menopause, this on the average occurs between the ages of 45 and 55.[5] Most women in this stage resort to the use of various remedies or medications and lifestyle changes with various degree of success, depending on the individual woman.[6] These menopausal symptoms leads to changes in cardiovascular function, lipid profile, fasting blood glucose, calcium levels and other biochemical parameters of the women[7,8] In view of these problems and complication women are increasingly turning to alternative remedies or therapies in an effort to manage their menopausal symptoms.[9,10]

Hormone therapy has been used widely by many postmenopausal women in management of menopausal symptoms. However due to the concern of its side-effects, efficiency, safety and complications, many postmenopausal women are now turning to alternatives treatment like honey[10,11] Honey is a natural complex product of bees which contains more than 180 substances including vitamins, amino-acids, mineral, enzymes, glucose, and fructose with water as the third greatest components.[12] Honey has been demonstrated to ameliorate various menopausal symptoms including reducing low density lipoprotein cholesterol, reducing inflammatory responses, decreasing oxidative stress and others[4,13] In other study

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antioxidants in honey was found to reduce weight, ameliorate abnormalities of lipid profile in rats and human subjects.[14] Also clinical study showed that natural honey reduces fasting blood sugar in obese subjects.[15] The fact that honey is rich in glucose and fructose could lead to increase in glucose inbalance and insulin resistance, a condition that postmenopausal women are already at risk of.[14] Lipid profile measures blood levels of total cholesterol (TC), low density lipoprotein (LDL) cholesterol, high density lipoprotein (HDL) cholesterol, and triglycerides (TG). The lipid profile helps to identify dyslipidemia; monitoring and maintaining healthy levels of these lipids is important in staying healthy.[16] Lipid profile have been found to be altered in menopause because of various reasons especially the changes in hormone levels which control most other metabolic activities of the human body like the estrogen.[17] The study therefore seeks to elucidate the changes in lipid profile of menopausal women after treatment with honey for four months.

2. Materials and Methods

2.1. Study subjects

This study involved 60 postmenopausal women aged 45 – 65, who were recruited from the health centers and primary school teachers in Orlu Local Government Area of Imo State, Nigeria. Participants who took herbal remedies, smokers, had history of serious medical, mental or gynecological diseases were excluded. Selected participants underwent physical examinations including blood pressure (BP), weight and height measurements, body mass index (BMI) and waist circumference (WC) were recorded at the beginning and end of the study.

2.2. Study procedure and design

The study protocol was approved by the Research and Ethical Committee of Imo- State University Teaching Hospital Orlu Imo State (IMSUTH). Participants were properly briefed on the nature of the study and informed concept obtained from them before the commencement of the study. For confidentiality the participants data were coded and assigned into a group based on the duration of menopause (1 – 5years and above 5years). They all receive 20g of honey daily. The participants took the treatment for 4 months; their health status, possible adverse effects and compliance were evaluated every week. Sixty (60) participants successfully completed the treatment. Fasting blood samples were collected from them and used for the analyzed. 10 mls of venous blood were withdrawn at the beginning and at the end of the study for the following determinations.

1. Lipid profile levels like LDL, HDL, VLDL, TG, and TC.
2. Serum glucose level: Serum fasting blood sugar.

3. Serum calcium level

2.3. Determination of blood lipid profile

Lipid profile was determined using enzymatic colorimetric methods. Total Cholesterol was determined by the method described by[9] and.[18] Serum triglyceride was determined by using the method described by and.[19] High density lipoprotein was determined using the method described by[20] and.[21] Low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (VLDL-C) was estimated by calculation according to the formular of[21].

Serum fasting blood sugar was determined using the method described by.[22] This involves the enzymatic oxidation of glucose in the presence of glucose oxidase.

Serum calcium was determined using the method described by[23] and.[24] Calcium ions (Ca^{2+}) react with O-cresolphthalein complex in alkaline solution to form violet coloured complex which is measured. These determinations were carried out using available commercial kits and were all done in accordance with the manufacturer's protocol.

2.4. Statistical analysis

The data generated was analyzed using SPSS statistics tool version 20.0 software to compare the changes in lipid profile, anthropometric and biochemical parameters. T-test and ANOVA was used for analysis of variance. $P < 0.05$ was taken as significant.

3. Result

Total of 60 postmenopausal women successfully completed the study and their characteristics are as follows:

Table 1: Characteristics of participants

No. of participants	Ages of participants		Duration of menopause	
60	45– 55 Years	56– 65 Years	1– 5 Years	6 Years above
60	40	20	18	42

howed a significantreduction in total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (VLDL-C). There were significant increases in high density lipoprotein cholesterol (HDL-C), compared with the baseline values.

howed that honey administration while increased blood calcium concentration significantly, reducesthe fasting blood sugar concentration of the research subjects after three months administration.

howed that honey administration leads to significant progressive reduction in weight, waist circumference and blood pressure of the research subjects, from the baseline values and the values after three months of honey administration.

Table 2: Proximate analysis, vitamin and mineral content of Honey.

Constituents	Quantities
Moisture (%)	20.15 ± 0.04
Crude protein (%)	0.67 ± 0.03
Crude fibre (%)	1.24 ± 0.08
Crude fat (%)	0.23 ± 0.02
Ash (%)	1.75 ± 0.74
Carbohydrate (%)	75.8 ± 0.64
Vitamin A(mg/Kg)	0.02±0.01
vitamin C (mg/100g)	0.8000 ± 0.07071
vitamin E (mg/100g)	0.0800 ± 0.02828
calcium (mg/g)	6.0800 ± 0.11314
Potassium (mg/g)	9.50 ± 0.01
Phosphorous (mg/g)	3.45 ± 0.02
Iron (mg/g)	0.10 ± 0.00

Values are mean ± SD for triplicate determination

Table 3: Effect of honey on lipid profile of postmenopausal women

Parameters	Baseline	One month	Two months	Three months	Four months
TC	4.87 ±0.83^a	4.55 ±0.67^b	4.34 ±0.59^b	4.25 ±0.59^b	
TG	1.31 ±0.43^a	1.28 ±0.66^b	1.11 ±0.54^b	1.08 ±0.43^b	
HDL-C	0.88 ±0.21^a	1.19 ±0.13^b	1.23 ±0.1^b	1.32 ±0.08^b	
LDL-C	3.82 ±0.83^a	2.75 ±0.75^b	2.74 ±0.64^b	2.64 ±0.57^b	
VLDL-C	0.59 ±0.20^a	0.57 ±0.29^a	0.51 ±0.23^b	0.49 ±0.20^b	

Value in the same rows bearing different letter of alphabets are significantly different ($p < 0.05$).

Table 4: Effects of honey on calcium and Fasting blood sugar (FBS) of postmenopausal women

Parameters	Baseline	One month	Two months	Three months
Calcium	2.27±0.47^a	2.72±0.15^b	2.81±0.15^b	2.97±0.20^b
FBS	5.15 ± 0.56^a	5.04 ± 0.57^a	4.99 ± 0.55^b	4.94 ± 0.60^b

Value in the same rows bearing different letter of alphabets are significantly different from each other ($p < 0.05$).

4. Discussion

The proximate analysis of Honey used in the work revealed the presence of Carbohydrate, Moisture, Crude protein, Crude fat, Crude fibre and Ash. This is similar to the work of[25], on the comparative analysis of the Proximate and Nutritional Compositions of Nigerian Bitter and Sweet Honey from Apis mellifera. Since carbohydrate is the major component of honey it may be responsible for most of the physical and nutritional characteristics.[26] Also honey contains minerals (calcium, potassium, iron)[25] and vitamins

Table 5: Effects of honey on some anthropometric parameters of postmenopausal women

Parameters	Baseline	One month	Two months	Three months
Weight	70.78±- 18.50a	68.46±- 14.54b	60.80±- 14.74b	59.66±- 14.70b
WAIST - Circumference	40.22±- 5.22a	38.53±- 2.79b	35.44±- 3.04b	35.34±- 2.99b
BP/Systolic	140.61±- 22.59a	134.00±- 23.84b	130.66±- 20.86 b	128.00±- 12.64b
BP/Diastolic	84.66±- 7.43a	81.33±- 3.51b	80.66±- 4.57b	80.00±- 4.57b

Values represent the mean ± SD for n=60. Values in the same row bearing different letter of alphabets are significantly different from each other ($p < 0.05$).

(A, C and E) whose presence may be suggestive of the antioxidant properties noted in honey in the work and are in line with the reports of.[27] Menopausal women experience lot of biochemical and anthropometric changes. These changes are noticed mostly in calcium (Ca), fasting blood sugar (FBS), lipids (TC, TG, HDL-C, LDL-C, VLDL-C), and anthropometric changes (blood pressure, waist circumference weight) in the women.

Calcium is a vital mineral the body uses to build strong bones and teeth, as well as taking part in many biochemical pathways. Its loss in menopause causes serious health challenge-osteoporosis. Menopausal osteoporosis occurs after cessation of estrogen production by the ovaries.[28] At baseline in this study, calcium concentration of postmenopausal women was at the lower limit of the reference range (2.27±0.47). The reduction in concentration may be linked to the continuous loss of calcium from the body which reached its peak at postmenopause.[29] However after intervention with honey, there were significant increases in calcium concentration of the postmenopausal women. This finding was in accord with the reports of[30] and.[30] Blood sugar levels are one of the biochemical parameters often affected by menopause. As fertility hormones (estrogen and progesterone) level drop their combined effect, affects blood sugar regulation and puts women at risk for insulin resistance which can promote the development of diabetes.[31] The baseline fasting blood sugar (FBS) concentrations of postmenopausal women was towards the upper limit of the reference range. This may likely be linked to reduced estrogen and insulin production.[32] The intervention with honey caused significant decreases in blood sugar concentrations of the postmenopausal women from 5.55±0.54 to 4.94±0.59. This is similar to the report of[33] which support honey as a novel antidiabetic agent. Lipid profile is blood tests

that are used to screen for abnormalities in lipids such as cholesterol and triglycerides. Cholesterol travels in blood attached to a protein hence the term lipoprotein. Lipoprotein analysis (lipid profile) measures blood levels of total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C), and triglycerides (TG). It helps to identify dyslipidemia. Monitoring and maintaining healthy levels of these lipids are important in staying healthy.[16] Lipid profile is altered in menopause because of various reasons especially the changes in hormone levels which control most other metabolic activities of the human body like the estrogen.[17]

This study at baseline revealed that serum levels of TG, LDL-C and VLDL-C were higher in postmenopausal women when compared to the levels after the intervention with honey. The alteration in lipid profile may be due to impairment in fatty acid metabolism.[34] These changes in lipid profile are probably caused by changes in hormonal status in postmenopausal women. The decreased level of estrogen in postmenopausal age may have various effects on metabolism of lipids.[17–38] The administration of honey demonstrated prominent reducing effect on TC, TG and LDL-C while improving or enhancing the HDL-C in postmenopausal women after three month of administration. Thus honey consumption had improving effects on lipid profile in postmenopause. This finding was similar to studies by[5] and[6] which reported that honey possesses beneficial effects on CVD risk factors and the lipid profile.

In the present study the mean age of menopause was 50.1years and was similar to data reported in previous study.[28–34,37–39] Also the subjects that had menopause for more than five years were over weights and more than half had dyslipidemia and hypertension. Thus postmenopausal women had the tendency of gaining extra weight after 5years of menopause and are more prone to developing other complication like hypertension. This finding collaborates with that of.[40] Weight gain during menopause occurs because of a drop in estrogen levels. The hormonal change of this condition causes women to gain weight around the mid-section (abdomen). Excess or reduced body weights are indicators that determine a person's health and increased risk of cardiovascular diseases. In the present study, the weights of postmenopausal women was (70.78±18.50) which were above ideal weight (60.7Kg for Africans) as stated by.[41] The administration of honey led to decrease in body weight of postmenopausal women (60.80±14.57 to 59.66±14.70) though not significant in line with[14] and[42] which showed the effect of natural honey consumption in diabetic patients and wistar rats respectively.

Waist circumference as constant measure of abdominal obesity is a significant predictor of a range of weight related health problems including hypertension, coronary heart disease and type II diabetes.[43]Menopause leads to increase in abdominal (visceral) adiposity especially during postmenopausal stage. This study at baseline showed that waist circumference of postmenopausal women was above normal (≥35cm). According to[44], a waist circumference greater than 35cm for women is abnormal. The report of this study was in line with that of[45] and[46] which stated that postmenopausal women were associated with increasing abdominal obesity. The administration of honey led to decrease in waist circumference of postmenopausal women (35.60±2.89 to 35.34±2.99) though not significant.

During menopause numerous biological and hormonal changes occur in the body that can lead to increased blood pressure.[34] In this study at baseline, systolic blood pressure of postmenopausal women was well above normal, while the diastolic blood pressures were within normal ranges as in.[47] Administration of honey led to modulation of systolic and diastolic blood pressure of postmenopausal women from (84.66±7.43 to 79.33±4.57) and a decrease in systolic blood pressure from (142.00±28.08 to 128.00±12.64). This is in line with the report by.[34]

5. Conclusion

Postmenopausal women suffers from so many complication which lead to changes in cardiovascular, lipid profile, fasting blood glucose, calcium levels and other biochemical parameters of the women. In other to manage these problems and complication, women are increasingly turning to alternative remedies or therapies including honey. The intervention with honey showed that honey significant reduces blood sugar, TC, TG and LDL-C while improving or enhancing the HDL-C and serum calcium content or concentrations of postmenopausal women. Thus honey consumption had improving effects on lipid profile, blood sugar, calcium content and some anthropometric indexes of postmenopausal women.

6. Source of Funding

7. Conflict of Interest

None.

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