Endocrinology & Metabolic Syndrome
ISSN: 2161-1017
OPEN ACCESS Freely available online
Research Article

Demystifying the Use of Honey in Diabetes Management: A Case of Type 2 Diabetes Patients at Kenyatta National Hospital, Nairobi, Kenya

Martha N. Chege[1]*, Catherine N. Kunyanga[2], Mary Mugambi[3]

[1]Department of Applied Human Nutrition, Nairobi City County Government, Health Services, Kenya; [2]Department of Food Science and Technology, University of Nairobi, Kenya; [3]Department of Nutritional Sciences, Technical University of Kenya, Kenya

ABSTRACT

Objective: The socio-economic burden of diabetes is of increasing public health concern in Kenya and the world over. There have been unmet expectations with the current management of diabetes, which has led some to turn to honey for its therapeutic benefits. Honey is valuable in management of various infections, and has been associated with management of type 2 diabetes and related complications. This study sought to establish the knowledge and practices of people living with diabetes on the use of honey, and find any possible associations in management of diabetes and/or its complications.

Methods: A cross-sectional study with a retrospective component was conducted on 139 respondents living with type 2 diabetes. This was done through a semi-structured interviewer-administered questionnaire to determine the respondents' socio-economic status, their knowledge and attitude and how these influenced their use of honey, and the correlations to the disease management. Consecutive blood sugar readings recorded over three months prior to the study were obtained from the respondents' hospital records. Health care providers were interviewed using a key informants guide to corroborate information obtained from respondents.

Results: Knowledge on or perceived benefits of honey did not translate to its actual use (r=-0.064). The longer respondents consumed honey the more likely they were to have elevated blood glucose levels (>7.8 mmol/L). There were double the number of respondents using honey with elevated blood sugar levels than there were whose levels were within normal range (4.4-<7.8 mmol/L). However, only a third of the respondents using honey had associated complications of nephropathy, ketoacidosis and diabetic foot. Generally, the number of respondents not using honey and experiencing any of the diabetes complications was at least two times more the number of those using honey.

Conclusion: With continued use of prescription drugs, controlled use of honey could be associated with positive disease outcomes, for either diabetes and/or complications related to diabetes. However, further scientific studies on the topic may be warranted for stronger evidence to support the use of honey as a food intervention in the actual management of type 2 diabetes.

Keywords: Type 2 diabetes; Honey; Glycaemic control; Diabetes co-morbidities; Knowledge; Practices

Abbreviations: Body Mass Index (BMI); CardioVascular Disease (CVD); Glycated Hemoglobin (HbA1c); Hypertension (HTN); International Diabetes Federation (IDF); Kenya shillings (KES); Kenyatta National Hospital (KNH); Kenya National Bureau of Statistics (KNBS); Millimoles per Litre (Mmol/L); Odds Ratio (OR); Random Blood Sugar (RBS); Standard Deviation (SD); Statistical Package for Social Sciences (SPSS); United States Dollars (USD)

INTRODUCTION

Diabetes is a chronic metabolic disorder characterized by sustained elevated blood glucose (hyperglycemia) which results from either defects in insulin secretion, insufficient insulin action or both. The more common symptoms of diabetes include: polyuria, excessive thirst, weight loss and fatigue. If not well controlled, diabetes leads to serious complications which would result in multiple diseases

Correspondence to: Martha N. Chege, Department of Applied Human Nutrition, Nairobi City County Government, Health Services, Kenya, Telephone: +254 721 529606, E-mail: chegeress@gmail.com

Received: June 20, 2019, **Accepted:** July 16, 2019, **Published:** July 22, 2019

Citation: Chege MN, Kunyanga CN, Mugambi M (2019) Demystifying the Use of Honey in Diabetes Management: A Case of Type 2 Diabetes Patients at Kenyatta National Hospital, Nairobi, Kenya. Endocrinol Metab Syndr 8:302.

or disorders that affect multiple body organs and would lead to increased morbidity and premature death [1]. According to the International Diabetes Federation (IDF), world over, 415 million people were living with diabetes, with more than 14 million being in the Africa region. There were 478,000 cases of diabetes in Kenya in 2015, with the prevalence rate among adults (20–75 years) being 2.2%. Some 287, 700 adults are believed to be undiagnosed in the country [2].

Though there is no known cause for diabetes, its aetiology is associated with environmental, social and genetic factors [3]. Currently, the disease is managed through administration of antidiabetic drugs and/or insulin, observation of a healthy diet, physical activity, avoiding tobacco, and minimal alcohol use [1]. The drugs in use may not offer the most comprehensive approach to the disorder, due mainly to cost implications and sometimes, their unavailability especially in rural settings [3]. People living with diabetes tend to be overweight due to high insulin levels not being able to channel glucose into muscle cells. The glucose is instead converted to fat and cholesterol, which often results to obesity, heart disease, poor blood circulation to the legs and eye disease [4]. Poor glycaemic control was associated to HbA1c levels of greater or equal to 7% and longer duration (more than 7 years) of living with diabetes. These categories of people living with diabetes had common factors like not following the recommended eating plan, increased non-adherence to management plans and negative attitudes towards diabetes [5]. Diabetes was also likely to be poorly controlled among males, elderly patients, those with higher body mass index (BMI), hypertryglyceridemia, hypercholesterolemia, and was associated to people living with diabetes on anti-diabetic drugs only [6].

Medical dietary therapy is a cornerstone of diabetes management, involving dietary counselling and various modifications to help in prevention of diabetes, manage existing conditions, prevent or reduce developing related complications [7,8]. Among various food interventions to facilitate the management of diabetes, the Mediterranean diet was associated with better glycaemic control and cardiovascular risk factors, including those of decreased fat diet [9].

As a food, honey is a carbohydrate whose intake should be taken into consideration among the total daily intake of carbohydrates. One teaspoon of honey is approximately 17 kilocalories [10]. For a diabetic diet, there is need to ensure the use of natural or unrefined honey, with no addition of cane sugar, industrial sugar, starch, glucose or malt [11]. Honey, being three times sweeter than sugar, may need to be used in much smaller quantities [11]. Pure honey is a better option in a diabetic diet than sugar and the common non-nutritive sweeteners due to its lower glycaemic index [10-12]. The components found in honey are mainly dehydrated monosaccharides of fructose (38%) and glucose (28%), along with trace elements of B-vitamins, Vitamin C, antioxidants and mineral elements [11-13]. How honey is able to regulate or stabilize blood sugar levels and reduce metabolic stress mainly due to its average 1:1 ratio of fructose: glucose. Fructose aids glucose intake to the liver, preventing its overload in the blood circulation [12]. Some oligosaccharides present in honey may also have systemic effects contributing to the antidiabetic outcome. Also, mineral elements available (chromium, copper and zinc) have also been recognized in their role in reducing elevated blood glucose, maintenance of normal blood glucose tolerance and insulin secretion from the pancreatic cells [14].

The aim of this study was to establish what factors would contribute to the use of honey among people with type 2 diabetes. The study also hoped to contribute to the body of knowledge on use of honey in diabetes control and management in Kenya, as the available data is limited.

METHODS

A cross-sectional survey with a partial retrospective component was conducted. A semi-structured interviewer-administered questionnaire was used to collect data on the diabetics' knowledge, perceptions and practices around the use of honey. Information from health care providers with different specialties working at the Kenyatta National Hospital (KNH) outpatient diabetes clinic was sought using key informants' interviews to corroborate information obtained from the respondents. Both the semi-structured questionnaire and key informant guide were designed and validated through a pre-test conducted at a high volume faith-based health facility in a neighbouring County.

The KNH outpatient diabetes clinic was purposely selected. As a public national referral hospital, this comprehensive study recruited 139 respondents among all cases presenting at the clinic, that would be a subset of diabetes patients in the Central and Eastern region of Kenya. The results, therefore, would be used to create inference to all patients fitting the criteria. The inclusion criteria from among patients booked for clinic on a particular day had: to be diagnosed with type 2 diabetes, to be attending clinic regularly over the previous 6 months, to have hospital records showing three consecutive months' random blood sugar (RBS) readings, and were consistent in use of their prescribed drugs. People living with type 1 diabetes and those with no records of previous consecutive blood sugar readings were excluded from the study.

Results on continuous variables were reported using means, standard deviation (SD) maximum (max) and minimum (min) ranges, while categorical variables were summarized in frequencies and percentages. To show associations, independent t-test, chi-square (χ^2), odds ratio (OR), binomial tests and bivariate correlations (r) were used for various data groups. A p-value less than or equal to 0.05 was considered statistically significant. All analyses were performed with SPSS® 20.0 for Windows.

RESULTS

50 males (39.7%) and 76 females (60.3%) were enrolled for the study. The mean age of the respondents was 57 years (SD=13.3, Min=24, Max=94). There was no significant difference (p=0.522) between the mean age of females (57.62 years) and that of the males (56.06 years). 39.7% of the respondents had completed secondary school education with 13.5% having completed tertiary education. More than half (56.3%) had a source of income, mainly through formal or casual employment, or running personal business ventures. About 15% received monetary support from family and/or government, or both. The estimated average income per month was approximately 200 USD1 (SD=181.28, Min=19.80, Max=900) where 60% received less than 198 USD and 28% received between 198 USD and 396 USD. Almost half of the household income (48.9%) was spent on food per month. There was a positive correlation between the monthly income and amount spent on food (r=0.686, p=0.000).

On the co-morbidities that the respondents had been treated for in the past year, 58% were for cardiovascular diseases (CVD), 55.6%

for neuropathy, 47.6% were for hypertension (HTN), while 44.4% were for retinopathy.

Among 90% of the respondents, the average RBS among was 9.48 mmol/L (SD=3.92, Min=3.7, Max=25.7). This is in comparison to the optimal target in people with diabetes which is 4-8 mmol/L [7]. There was no significant difference between the blood sugar readings among respondents using honey and those not using honey (t=-0.274, 112df, p=0.785). However, respondents using honey were more likely to have an optimal RBS reading compared to those not using honey (OR=1.545, χ^2 = 0.908, 1df).

Male respondents were more likely to use honey than their female counterparts (OR=1.058, χ^2 = 0.016, 1df), but the difference between gender was not statistically significant (p=0.899). Males were less likely to have an optimal RBS reading compared to the female respondents (OR=0.557, χ^2 = 2.038, 1df, p=0.153). There was a negative correlation between knowledge on benefits of honey in diabetes and the actual use of honey (r=-0.064, p=0.341).

There was a positive correlation between the number of years the respondents had consumed honey with the average RBS reading (r=0.254, p=0.211). Up to 63% of respondents alluded to taking honey in standard proportions with 53% taking one teaspoon and 41% taking one tablespoon. Frequency of intake varied mainly between once daily (37%) or twice a week (14.8%). Almost half (48%) of the respondents used pure honey sourced from farmers, while 41% obtained processed honey from various retail outlets.

Respondents who had been using honey were twice more likely to have an elevated RBS reading than an optimal RBS. Further, at least three times less the number of respondents using honey had developed nephropathy, diabetic ketoacidosis and/or diabetic foot complications over one year. The number of respondents not using honey and experienced any of the common diabetic complications was at least twice the number of respondents using honey.

DISCUSSION

Individuals using anti-diabetic drugs have expressed dissatisfaction with unmet treatment goals and associated limitations. This has led some to search for different options, mainly complementary and alternative medicines, honey being one of those [14]. While it is possible that people living with diabetes use honey, some may not be aware of its effects, mainly due to lack of updated or comprehensive education from their health advisors [15]. Some could be using this natural product due to its perceived benefits to their general health.

The mean age among the respondents in this study was 57 years. This fell within the national age group (45-59 years) of respondents found to be having the highest raised fasting blood sugar at the Kenya STEPwise survey on non-communicable diseases risk factors [16]. The national survey also found that only 40% of Kenyans who were aware of their elevated blood sugar were on prescribed medication while 5% were using herbal therapy. This study found that 48% of the estimated monthly incomes was spent on food at the household level. These findings are comparable to those of various Kenya National Bureau of Statistics (KNBS) surveys conducted between 2010 and 2015. These indicated that the general population used on average 45% of their income on food and drinks [17]. The slightly higher proportion noted in this study may be due to the fact that people living with diabetes may not be at liberty to consume some food types. They would need to purchase different varieties of fruits and vegetables in larger quantities to manage the condition, thus driving up their proportion of income spent on food.

Compared to this study where the more reported co-morbidities were CVD (57.9%), neuropathy (55.6%) and HTN (47.6%), a large integrated health survey in the USA indicated the most prevalent diabetes co-morbidities to be high cholesterol (an independent risk factor for CVD), HTN (87.2%) and CVD (22.3%) [18]. A different study showed the common co-morbidities to include HTN (82.1%), overweight/obesity (78.2%), hyperlipidemia (77.2%), chronic kidney disease (24.1%) and CVD (21.6%) [19]. There was no published research on this within Sub-Saharan Africa.

This study showed no significant difference (p=0.785) between the average blood sugar readings of respondents using honey and those not using honey. There was also no standard measure or consistent frequency in use of honey among some of the respondents. Both the respondents and the key informants could attribute these factors to: lack of verification of the purity of honey consumed, lack of standard references for periods of honey consumption and amounts, and differing postprandial times for measuring RBS with and among the respondents. Timings in taking the RBS readings were varying between 30 minutes, 1 hour and 2 hours postprandial. In type 2 diabetes, peak postprandial glucose occurs 2 hours after a meal, which is an indication of inadequate glucose disposal. This is unlike a peak postprandial glucose of about 1 hour after a meal in people without diabetes [20].

Male respondents were more likely to use honey than women. This could be associated with the better socio-economic status of males, whereby in this study, the difference in means in the males' monthly income was found to be statistically significant compared to that of females (p=0.032).

A negative correlation was observed between knowledge on the benefits of honey in diabetes and actual use of honey. This could be due to the fact that there was not much information or evidence on the effectiveness of controlling blood glucose levels through use of honey [21]. Respondents in this study who had been using honey in either food or drink for some time (up to 4 years) were cautiously optimistic of its contribution in maintaining a controlled blood sugar or for any other benefits. Those who had used honey for longer had a relatively higher RBS reading compared to those who had used honey for a shorter period. In an ongoing study, Abdulrehman (2016) has been using raw unprocessed honey as the sole medication for type 2 diabetes mellitus at an empirical dose of 2g/kg/day. He had recorded persistent hyperglycemia and dyslipidemia which, unexpectedly, did not lead to development of any of the macro-vascular complications (coronary heart disease, hypertension or cerebral stroke) in patients who did not have these complications before the trial. He attributed these positive effects to weight reduction or the antioxidant effects of honey, or both. These findings happened without medication or a specific dietary regimen [22].

Male respondents were less likely to have an optimal RBS compared to the female counterparts. This could be because, males had higher purchasing power and thus more likely to have access to diets outside the advised diet plan. Nationally, there were marked variation in the use of diabetes medication between women (57%) and men (17%) [16]. Another explanation may be from the general observation that females have better health seeking behaviour than men. Women have more interest in and do more active seeking of

health related information. They are more attentive, compared to men, to relate how their expenditures in everyday goods or services would affect their health. They also are more likely to receive more health information by informal means through friends, workmates or relatives [23]. Research had shown women to be more likely to search for health information than men [24]. The search for information online is more common among more educated and middle income earners, who had access to internet at home or work. This would translate to this category of people being more likely to take diabetes self-care proactively [25].

CONCLUSION

Pure honey could be considered as part of a food intervention in the management of type 2 diabetes. Honey use, however, should be founded on standard protocols or guidelines for more comprehensive health management to people living with diabetes. This would warrant further scientific studies on the topic to generate stronger evidence-based findings.

DECLARATIONS

Ethics approval and consent to participate

The study received the approval of the Kenyatta National Hospital, University of Nairobi Ethics and Research Committee (P438/06/2015, date October 28, 2015).

Informed consent was sought from the client or treatment buddy or primary care giver during the recruitment of respondents for the study. Participation was voluntary and those who agreed to participate were made to understand the study process and the relevance of the study. All data collection material was number-coded to ensure confidentiality of the participants.

AVAILABILITY OF DATA AND MATERIAL

The datasets used and analysed during this study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

The authors did not have any external funding.

AUTHORS' CONTRIBUTIONS

Martha Chege was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

The author would like to thank the family and mentors for their support to complete this work.

REFERENCES

1. National Diabetes Prevention and Control Program. Kenya national clinical guidelines for the management of diabetes mellitus. Nairobi; 2018: 2nd Edn.
2. http://www.idf.org/membership/afr/kenya
3. Erejuwa OO. Effects of honey in diabetes mellitus: matters arising. J Diabetes Metab Disord. 2014;13:23.
4. Ahmed AM. History of diabetes mellitus. Saudi Med J. 2002;23(4): 373-378.
5. Khattab M, Khader YS, Al-Khawaldh A, Ajlouni K. Factors associated with poor glycaemic control among patients with type 2 diabetes. J Diabetes Complications. 2010;24(2)84-89.
6. Gopinath B, Sri Sai Prasad M, Jayarama N, Prabhakara K. Study of factors associated with poor glycaemic control in type - 2 diabetic patients. GJMEDPH. 2013;2(2).
7. MoH. National clinical guidelines for management of diabetes mellitus. Nairobi; 2010: 1st Edn.
8. American Diabetes Association. Nutritional recommendations and interventions for diabetes. Diabetes Care. 2007;30(1): S48-S65.
9. Esposito K, Maiorino MI, Bellastella G, et al. A journey into a Mediterranean diet and type 2 diabetes: a systemic review with meta-analyses. BMJ Open. 2015;5(8).
10. http://www.benefits-of-honey.com/diabetic-diet.html
11. Ediriweera ERHSS, Premarathna NYS. Medicinal and cosmetic uses of bees' honey - a review. AYU. 2012;33(2): 178-182.
12. http://www.livinghoney.biz/the-honey-revolution.html
13. Al-Waili F, Haq A. Effects of honey on antibody production against thymus-dependent and thymus-independent antigens in primary and secondary immune response. J Med Food. 2004; 7(4):491-494.
14. Erejuwa OO, Sulaiman SA, Wahab MSA. Honey - a novel anti-diabetic agent. Int J Biol Sci. 2012;8(6):913-934.
15. Wahome EM. Nutritional Knowledge, status and dietary practices: a case study of diabetes type II patients at Kikuyu Mission Hospital diabetes clinic. University of Nairobi Research Archive. 2012.
16. MOH, KNBS & WHO. Kenya STEPwise survey for non-communicable disease risk factors. Nairobi; 2015.
17. http://www.nation.co.ke/newsplex/food-shelter-clothing/-/2718262/3233540/-/shnjmz/-/index.html
18. Pantalone KM, Hobbs TM, Wells BJ, et al. Clinical characteristics, complications, co-morbidities and treatment patterns among patients with type 2 diabetes mellitus in a large integrated health system. BMJ Open Diabetes Res Care. 2015; 3:e000093.
19. Iglay K, Hannachi H, Howie PJ, et al. Prevalence andco-prevalence of co-morbidities among patients with type 2 diabetes mellitus. Curr Med Res Opin. 2016; 32(7): 1243-1252.
20. Schrot RJ. Targeting plasma glucose: pre-prandial versus postprandial. Clin Diabetes. 2004; 22(4): 169-172.
21. Anarkooli IJ, Ganji HS, Pourheidar M. The protective effects of insulin and natural honey against hippocampal cell death in streptozotocin-induced diabetic rats. J Diabetes Res. 2014: 491571.
22. Abdulrhman MA. Honey as a sole treatment of type 2 diabetes mellitus. Endocrinol Metab Syndr. 2016;5:232.

23. Stefan EK. Gender differences in health information behaviour: a Finnish population survey. Health Promot Int. 2013.

24. Higgins O, Sixsmith J, Barry MM, Domegan C. A literature review on health information-seeking behaviour on the web: a health consumer and health professional perspective. Stockholm: ECDC. 2011.

25. Ayele K, Tesfa B, Abebe L, et al. Self-care behaviour among patients with diabetes in Harari, Eastern Ethiopia: the health belief model perspective. PLoS ONE. 2012; 7(4):e35515.