

# Clinical interactions of honey with antidiabetic drugs among some Sudanese diabetic patients in Khartoum, 2013

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## Abstract

**Background:** The aim of the study was to assess the possible interactions of honey with anti-diabetic drugs used by the Sudanese diabetic patients attending two main hospitals in Khartoum, Sudan. **Methods:** The study was two month, cross-sectional, hospital-based study, during the period from April to May, 2013. **Results:** 260 of diabetic patients were chosen and only 68 were enrolled in the study, 32 (47.1%) were male and 36 (52.9%) females, the majority were elderly 32(47%), the patients were from different tribes and different areas. The majority of the patients were from Khartoum 24 (35.2%) and central Sudan 23 (33.8%), 51 (75%) of the patients were clinically diagnosed with type 2 diabetes mellitus, Hypertension as complication was found in 39.7% of the patients whilst 39.7% were without complications. **Conclusions:** The use of the honey concurrently with anti-diabetic drugs was with significant positive effect. Our findings revealed that, the illiterate and university patients represent the majority regarding the honey utilization. The majority of respondents use honey according to their own knowledge and did not inform her/his doctors.

**Key words:** Diabetic, drugs, honey, hypoglycemic, interactions, Sudanese

## INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder resulting from a defect in insulin secretion, action, or both. Insulin deficiency in turn leads to chronic hyperglycemia.<sup>[1]</sup>

As the disease progresses, tissue or vascular damage will occur leading to severe diabetic complications such as retinopathy, neuropathy, nephropathy, ischemic heart disease, stroke and peripheral vascular disease, and diminished quality of life.<sup>[2,3]</sup>

Diabetes is the most common endocrine disorder by the year 2010. It is estimated that more than 200 million people worldwide will have DM and 300 million will subsequently have the disease by 2025.<sup>[1]</sup> The majority of DM populations will emerge from developing countries that often had a poor glycemic control, with a high prevalence of acute and chronic complications, and a low quality of life.<sup>[2]</sup>

Several types of Oral hypoglycemic agents were available and used to lower the high Blood glucose level such as sulfonylureas, thiazolidinedione, biguanide, and acarbose.<sup>[3]</sup>

The American Diabetes Association estimated the national costs of diabetes in the USA for the year 2002

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to be \$USA 132 billion, increasing to \$USA 192 billion in 2020.<sup>[4]</sup>

Elamin *et al.*, in 1992, stated that, in Sudan, due to limited resources, most of the patients (51%) had reduced or abandoned insulin therapy due to nonavailability or nonaffordability of this drug. Most patients did not receive satisfactory diabetes care and oriented educations, leading to a lower rate of clinic attendance (55%) and had poor dietary knowledge (78.5%).<sup>[5]</sup>

In Sudan, few drugs available to manage the DM are not readily affordable to the poor people<sup>[6]</sup> whom represent the majority of the Sudanese people.<sup>[7]</sup>

The most recent data from a small-scale study conducted in 1996 indicated 3.4% of the prevalence in morbidity and mortality of DM in Sudan.<sup>[8]</sup> While the recent report estimates the diabetes population at around 1 million (95%) among type 2 diabetes patients.<sup>[9]</sup>

Many factors governed the DM control among Sudanese such as economic problems,<sup>[7,8]</sup> educational level,<sup>[10]</sup> particularly the knowledge regarding diabetes.

Honey is a natural substance produced by bees from nectar. The composition of honey is influenced by a number of factors such as geographical origin, botanical sources of nectar, environmental and climatic conditions as well as processing techniques.<sup>[11]</sup>

Therefore, research on the desired pharmacological effects and possible unwanted side effects or toxicity is required despite the availability of various classes of antidiabetic agents.<sup>[12]</sup>

Honey was used widely by Sudanese diabetic patients due to cultural beliefs about their safety and its magic healing power reported by the prophet.

This study aimed to assess the possible interactions exist with the concurrent use of honey with conventional available hypoglycemic agents used by Sudanese diabetic patients in two main teaching hospitals in the capital of the Sudan during 2013 summer.

## MATERIALS AND METHODS

### Ethical considerations

The study was approved by the National Committee represented as The Research Department, Ministry of Health, Khartoum state, in the form of Ethical Clearance. Besides, patient informed consent was filled by all participant patients or their co-patients in individualized patterns.

### Study design

A cross-sectional, hospital-based concurrent survey was conducted on diabetic patients in two major hospitals in the capital of Sudan. Hospitals were selected according to their capabilities to fit our study population needs, namely:

- Khartoum Teaching Hospital, particularly its referring clinic unit
- Al-Ribat Teaching Hospital with its special units for diabetic and diabetes education center.

### Study population

Type 1 and type 2 diabetic patients attending the outpatient clinic in the two selected hospitals were enrolled in the study.

All diabetic patients taking honey were actively included in the study while those whom did not meet our criteria were excluded.

### Sample size

The simplest formula of sample size determination ( $N = PQZ^2/d^2$ ) was used to estimate our sample size ( $N = 384$ ).

Where  $N$  = sample size,  $P$  = prevalence factor,  $Q = 1-p$ ,  $Z$  = constant 95% occurred 1.96, and  $d$  = desired margin.

### Data collection

Patients were interviewed through a predesigned questionnaire that contains items that are directly related to diabetes and the concurrent use of honey with antidiabetic drugs.

Patients were asked about their personal information and then with regards to their diabetes condition (type, duration, date of diagnosis, and type of medications used for the treatment of DM).

They were asked further questions regarding the honey used, such as honey source, insist to use it, frequency of use, who prescribed it, experience of any effect(s), and if he/she had informed his/her doctor.

### Data analysis

Statistical evaluation was performed with Statistical Package for Social Science (SPSS) computer program version 16 release 16.0.0 (September 13, 2007), copyright (c) SPSS Inc., USA. Data were analyzed by means of the Chi-square test to compare the mean differences for various results. The differences were considered to be significant at  $P \leq 0.05$ .

## RESULTS

### Patients' characteristics

From a total of 384 data collection form, only 260 were

filled and 68 of the patients met our criteria and enrolled in the study.

The gender distribution of the study population showed that 32 (47.1%) were males and 36 (52.9%) were females. The age of the subjects enrolled into the study ranged from 16 years to >60 years old. The educational level of the subjects ranged from noneducated, completing less than high school to completion of a graduate school degree. In this category, 32.3% of the study patients were illiterates ( $n = 22$ ), while the university represented 23 (33.8%). The residence distribution of the study population showed that more than 50% lives in the capital and central of the Sudan and no participant came from the South country part as seen in Table 1.

**Disease status among the participants**

39.7% of the participants have no complications with DM and the same proportion have hypertension as shown in Figure 1.

Depending on the gender factor, 75% ( $n = 51$ ) of the respondents were diagnosed with type 2 DM, whereas type 1 DM represents 25% ( $n = 17$ ).

Regarding the medication used by patient, sulfonylurea represents 36.8% ( $n = 25$ ), and use by male represents 31.3% ( $n = 10$ ) while female use appears to be 41.7% ( $n = 15$ ) as shown in Table 2.

**Answer of respondents to questions regarding the honey use**

The survey revealed that different honey sources were shown in Figure 2, depending on patient education level,

66.2% of the patients obtained the honey from the trusted source, while 27.9% of them obtained the honey directly from the market [Figure 2], besides, 68.2% of the university respondents and 72.7% of the illiterates believed that honey was safe and insisted to use it.

Moreover, majority of the respondents used honey based on their self-knowledge and did not inform their doctors, while the majority of the honey users were insisted and planed to use honey again, these findings are shown in Table 3.

**The clinical interaction patterns of honey with antidiabetic agents**

Half of the participants reported that, Honey was effective in lowering the Blood glucose when used concomitantly with antidiabetic agnets, whilst the rest opinion regarding honey effectiveness, either null or not sure [Figure 3].

**DISCUSSION**

Recently, there was a renewed interest in the use of natural products, including honey, in the treatment of diabetes.<sup>[13]</sup>

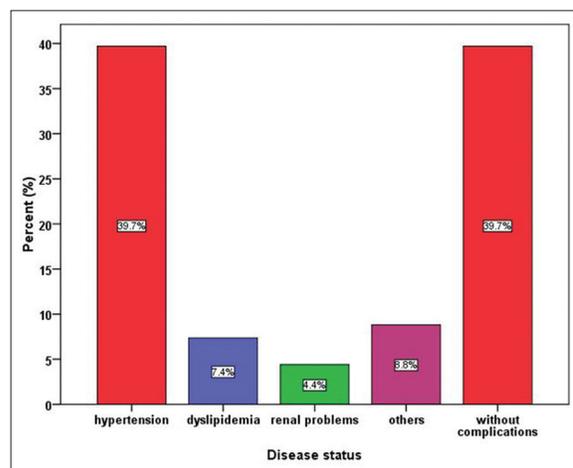
From the suggested sample size, only 260 patients returned and only 68 (26.2%) met the study criteria and enrolled into the study, this was due to the lack of some patients' co-operation.

The study characterization showed no significant variation in gender, residence, and educational level among the participants, except in the age that vary significantly ( $P = 0.047$ ), indicating the proper sample selection with minimum observers bias which reflects the true phenomenon distribution among the study population.

Because the study was conducted in Khartoum Teaching Hospital and Al-Ribat Teaching Hospital, most of the patients were from Khartoum and central Sudan.

**Table 1: Population characteristics (n=68)**

Patterns	Frequency (%)	P
<b>Age</b>		
Children (0-15)	0 (0.0)	0.047
Adult (16-40)	9 (13.2)	
Elderly (41-60)	32 (47)	
Geriatric (>60)	27 (39.6)	
<b>Gender</b>		
Male	32 (47.1)	0.635
Female	36 (52.9)	
<b>Residence</b>		
Capital	24 (35.2)	0.362
Central	23 (33.8)	
West	10 (14.7)	
East	4 (5.8)	
South	0 (0.0)	
North	7 (10.2)	
<b>Patient education</b>		
Illiterate	22 (32.3)	0.246
Primary	13 (19.2)	
Secondary	10 (14.7)	
University	23 (33.8)	



**Figure 1:** Patterns of the disease status associated with diabetes among the participants

This survey reported that the DM complications among the participants were mainly; hypertension, or without complications, also the DM type was found to be type 2 and the commonest hypoglycemic agent used was sulfonylurea, this may be due its affordability.

Our findings revealed that there was a restriction of the honey use among the participants, while the illiterate and university patients' represent the majority regarding the honey utilization.

The majority of participants were insisted to use honey, because, they think it is safe regardless its efficiency and they use honey irregularly.

The majority of respondents were catalyzed to be honey user according to their own knowledge. This may draw attention to the importance of health education to the communities.

Although, the majority of participants obtained honey from trusted person, they believed that honey was safe as

a sweetening agent. While others obtain it directly from the market and did not care about its originality, which was a determining factor for safety.

In spite of half of the diabetic patients whom used honey irregularly by their own self-knowledge as it mentioned in prophetic medicine, recent findings indicated that honey improves glycemc control and exerts hypoglycemic effect in nondiabetic, alloxan, and streptozotocin-induced diabetic rats.<sup>[11,12]</sup>

Other study showed that the combination of antidiabetic drugs with honey improves glycemc control in diabetic rats,<sup>[14]</sup> while in humans, honey supplementation reduces hyperglycemia.<sup>[15,16]</sup>

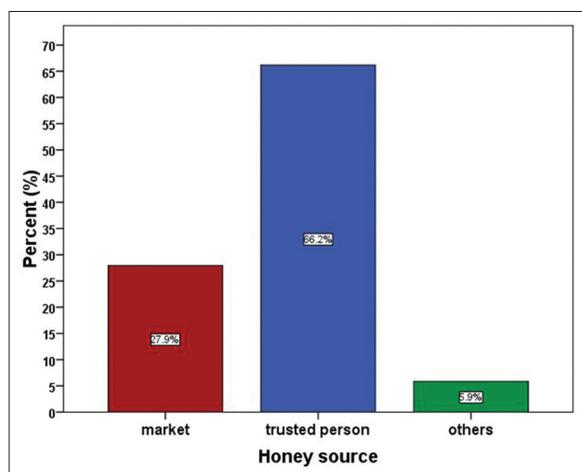
All honey users did not inform her/his doctors, reasoning that some patients may be worried regarding the negative attitude of doctors toward honey and will be insisted to use it again, this may be due to their high trust of their self-knowledge that was based on their culture and religion. The diabetes health care providers observed patients with practices that adversely affect their condition management.<sup>[17]</sup>

Although different hypoglycemic agents were used at the same time with honey, half of the patients reported positive effect for the honey, which can be taken as an evident to support the cultural information and practices, whereas others either did not observe or not sure about the honey effect.

**Table 2: Patterns of the diabetes type and the drug used based on the gender type (n=68)**

Characteristics	Frequency Total n (%)	Gender		P
		Male (n=32)	Female (n=36)	
Type of diabetes				
Type 1	17 (25)	12 (37.5)	5 (13.9)	0.048
Type 2	51 (75)	20 (62.5)	31 (86.1)	
The used of medications				
Insulin	22 (32.4)	12 (37.5)	10 (27.8)	0.593
Sulfonylurea	25 (36.8)	10 (31.3)	15 (41.7)	
Biguanide	13 (19.1)	5 (15.6)	8 (22.2)	
Thiazolidinedione	1 (1.5)	1 (3.1)	0 (0.0)	
Combination	7 (10.3)	4 (12.5)	3 (8.3)	

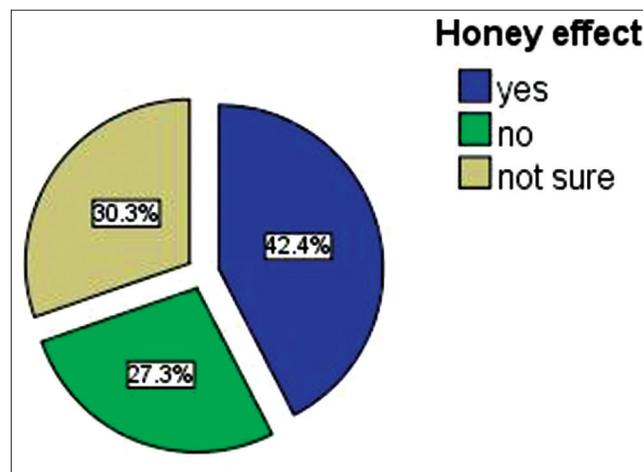
The result was considered significant when  $P \leq 0.05$



**Figure 2:** Summary of the respondents answer to the question regarding the honey source

## CONCLUSION AND RECOMMENDATIONS

In Sudan, based on cultural and religious reasons, honey was used by DM patient at the same time with antidiabetic



**Figure 3:** Participants opinions regarding the effectiveness of the honey use

**Table 3: Summary of the respondents answers to the questions regarding the honey use based on their educational level (n=68), missed (n=2)**

Questions/education	Illiterate (n=22)	Primary (n=13)	Secondary (n=9)	University (n=22)	P
Why do you insist to use honey?					
Safe	16 (72.7)	5 (38.5)	5 (55.6)	15 (68.2)	0.426
Effective	5 (22.7)	5 (38.5)	2 (22.2)	2 (9.2)	
Cheap	0 (0.0)	1 (7.7)	1 (11.1)	3 (13.6)	
Others	1 (4.5)	2 (15.4)	1 (11.1)	2 (9.2)	
Who prescribed honey for you?					
Tra. healers	3 (13.6)	1 (7.7)	0 (0.0)	3 (13.6)	0.485
Friends	5 (22.7)	6 (46.2)	4 (44.4)	4 (18.4)	
Self-knowledge	13 (59.1)	4 (30.8)	5 (55.6)	12 (36.8)	
Media	1 (4.5)	2 (15.4)	0 (0.0)	3 (13.6)	
How often did you use honey?					
Daily	7 (31.8)	2 (15.4)	3 (33.3)	4 (18.4)	0.660
Weekly	1 (4.5)	0 (0.0)	0 (0.0)	2 (9.2)	
Other	14 (63.6)	11 (84.6)	6 (66.7)	16 (72.7)	
Inform doctor about the use of honey?					
Yes	4 (18.2)	1 (7.7)	2 (22.2)	5 (22.7)	0.714
No	18 (81.8)	12 (92.3)	7 (77.8)	17 (77.3)	
Do you intend to use honey again?					
Yes	19 (86.4)	13 (100)	7 (77.8)	15 (68.2)	0.382
No	3 (13.6)	0 (0.0)	1 (11.2)	4 (18.4)	

drugs to manage the glucose level and to decrease the complications.

Doctors should be aware about the use of honey, as it may affect the outcome and the management of their disease.

We recommended future deep clinical studies that enlisted a large sample size for investigating the potential role of honey in the management of DM and their clinical interactions with antidiabetic drugs.

Consumption of limited amounts of honey was believed to be safe and help to control diabetes, also compensate their intake of vitamins and nutrients such as B1, B6, B12, C, and E, as well as Biotin, but patients had to make sure that it was pure, raw, and organic honey and not adulterated by starch, glucose, or even malt.

It was important to consult a doctor adopting this practice.

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Nil.

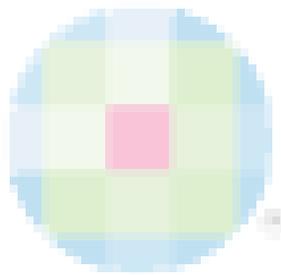
### Conflicts of interest

There are no conflicts of interest.

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