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Knowledge and attitudes towards type 2 diabetes and prevention strategies among regular street food consumers: A cross sectional study in Dar es Salaam, Tanzania

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ABSTRACT

This study aimed to assess the knowledge and attitude of Regular Street Food Consumers (RSFCs) towards type 2 diabetes prevention strategies and the influence of knowledge and attitude on metabolic risk factors. We conducted a cross-sectional study among 560 RSFCs in Dar-es-Salaam. Data on demographic characteristics, behavioural risks for type 2 diabetes, anthropometric and biochemical measurements, knowledge and attitude data were collected. Using linear regression, we assessed the factors associated with the outcomes of interest. Significant factors associated with increased knowledge scores were being between 41 and 64 years old, having secondary/college education and high income. Positive attitude scores were associated with being female, having secondary/college education and being married/cohabiting. Combined scores were a blend of the separate scores related to knowledge and attitude; age, sex, education, income and marital status were significantly associated with this parameter. The prevalence rates of low knowledge, negative attitude and low combined low knowledge and negative attitude were 78.3%, 32.0% and 68.8%, respectively. Those found with combined good knowledge and negative attitude were significantly more likely to have increased: fasting blood glucose levels, body mass index and waist circumference. Among the study participants, knowledge was low, and attitudes were negative towards preventative measures for type 2 diabetes among RSFCs. Furthermore, having adequate knowledge and positive attitude towards non-communicable diseases including type 2 diabetes did not influence risk factors for type 2 diabetes. We recommend awareness campaigns and interventions that can influence behavioural change among RSFCs and vendors towards type 2 diabetes prevention.

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Introduction

Non-communicable diseases (NCDs) including cardiovascular diseases (CVDs), type 2 diabetes and hypertension are of global, regional and local public health importance due to their impact on morbidity and premature mortality (Roth et al. 2018).

Behavioural risk factors for metabolic diseases including tobacco use, unhealthy diet, physical inactivity and excessive use of alcohol are increasing dramatically everywhere (Sharma and Padwal 2010; Diabetes Federation International 2019; Kavishe et al. 2015; World Health Organization 2015). Intermediate physical risks such as raised blood pressure, raised triglycerides, low-density lipoprotein and overweight/obesity are also rising at an alarming rate globally. In Tanzania, the World Health Organization STEPs Survey report of 2012 shows that the prevalence rates of raised blood pressure, raised triglycerides and overweight/obesity were 26%, 33% and 26%, respectively (WHO 2012). These were linked to a high level of risk behaviour, including alcohol consumption (29%), smoking (16%) and inadequate consumption of fruits and vegetables (97%) (WHO 2012).

Over the last two decades, the world has seen a shift in eating patterns due to globalization, nutrition transition to more processed foods and urbanization, which increase consumption of street foods (Adela and Hu 2015; Vorster, Kruger, and Margetts 2011; Mendez and Popkin 2004). By definition, street-vended foods are foods or beverages sold after being prepared on the street or at home and ready to eat or to be consumed immediately or later on the street/public places without further processing or preparation (WHO 1996; Bryan et al. 1997). Globally, up to 2.5 billion people consume food prepared and sold in the street daily (Fellows and Hilmi 2011). Street foods are high in excess fats, low in vegetables and are served with little or no fruit (Sharma and Padwal 2010; Lopes Nonato et al. 2016; Kinabo 2003; FAO 2007). The large amounts of carbohydrates and proteins in food bought from street vendors lead to excess energy intake (Sharma and Padwal 2010; Lopes Nonato et al. 2016; Kinabo 2003; FAO 2007). Hence, consumers are at risk of being exposed to excessive energy intake due to overconsumption of carbohydrates and are predisposed to metabolic risk factors for CVDs (Lopes Nonato et al. 2016). Good knowledge of risk factors, signs and symptoms, prevention measures and complications of the disease facilitates the engagement in healthier behavioural practices (Mboera et al. 2010; Nguma 2010). Regular street food consumers (RSFCs) are vulnerable to NCDs due to increased exposure to unhealthy eating habits, attitude and cultural practices (Sharma and Padwal 2010; Lopes Nonato et al. 2016; Kinabo 2003; FAO 2007; Chege et al. 2015). There is limited information on knowledge and attitude towards NCDs prevention measures among RSFCs. Assessment of knowledge and attitudes focuses on infectious diseases among regular street food consumers (Fontannaz-Aujoulat et al. 2016; Frank 2016; Roth et al. 2018) and often targeted food vendors (Marutha and Chelule 2020; Jillian et al. 2019; Hill et al. 2016; Lamin-Boima 2017). Therefore, a cross-sectional study was conducted among RSFCs to assess the knowledge and attitude towards type 2 diabetes prevention strategies and the influence of knowledge and attitude on metabolic risk factors. Such evidence is essential to inform preventative intervention programs aiming to address a growing problem in a lower middle-income country like Tanzania.

Material and Methods

Study area

This study was conducted in three randomly selected districts (out of five) in Dar es Salaam city in Tanzania. As one of the top 10 most populated cities in Africa, Dar es Salaam is a thriving metropolis with an estimated 7 million inhabitants (UN 2020; Wikipedia 2020). We chose Dar es Salaam for this study since the majority of its male population with low and middle income is estimated to consume street food daily (Kinabo 2003).

Study design

A cross-sectional study was conducted between July and September 2018 as part of a cluster randomized field trial aiming to assess the effectiveness of interventions to reduce cardio-metabolic risk factors among RSFCs in Dar es Salaam, Tanzania.

Sample size estimation

The sample size was calculated using conservative prevalence rate values, i.e. we assumed the prevalence rates of low knowledge on risk factors, symptoms and complications of type 2 diabetes and recommended daily amount of different food groups among RSFCs to be 50%. The following additional parameters were used for sample size estimation: $Z = 1.96$; value of standard normal distribution at 95% confidence level and margin of error 'e' = 6%; design effect (DE) of 2.0; and a non-response rate of 10%, estimated from the experience of the larger study using the same participants (Lemeshow et al. 1990). With the above statistical parameters, a sample size of 593 was deemed sufficient. The formula for sample size calculation can be accessed from Naing, Winn, and Rusli (2006).

Sampling procedure

Multistage cluster sampling was applied to obtain the required sample size. At the first stage, three districts, namely Ilala, Kinondoni and Ubungu, were randomly selected from the five districts in the Dar es Salaam city. The second stage of sampling involved mapping the market places in each selected district where most regular street food consumers (RSFCs) purchase their food. Sampling details are presented elsewhere (Kagaruki et al. 2021). With our operationalized definition, we define RSFC as a person who consumes at least three street food vended lunches per week.

Data collection method

A questionnaire was adapted from the WHO STEP questionnaire and previous, related studies (WHO 2012; Ismail et al. 2013) and translated into Kiswahili to suit the local population. The RSFCs' knowledge and attitude assessment questions were previously standardized for similar published studies conducted in the same context (Fatema et al. 2017; Fenwick et al. 2013). The questionnaire was piloted by the team members with 10% of the actual sample size in the site, which was not part of the study. After the pilot, all

issues that were identified were refined accordingly. The principal investigator, in collaboration with each market manager, identified a suitable building with available space to ensure privacy during data collection. Consent was obtained from each participant before interviews, blood collection and physical measurements.

Knowledge

This study assessed the knowledge level of RSFCs. Topics that were covered included the knowledge of risk factors, symptoms and complications of type 2 diabetes and knowledge of what constitutes a healthy diet in relation to prevention of non-communicable diseases. Twenty-four items were adopted from existing grey literature and used to assess the knowledge level of each individual participant (Kagaruki et al. 2018; Shah, Kamdar, and Shah 2009; Bano et al. 2013; Fatema et al. 2017; Saleh et al. 2012; Yang et al. 2017). The possible answers per each item were 'yes/no/do not know'. A weight of '1' was given to each mentioned item and '0' if not mentioned. Participants were also assessed on their knowledge on the daily-recommended amount of foods from different food groups (proteins, fats, carbohydrates, fruits and vegetables, high-fibre food, red meat, high glycaemic index foods and salted foods). They were asked to judge each amount as 'large', 'average', 'small' or 'not sure'. A correct response was given a score of '1' and a wrong or absent response received '0'. For example for the case of fats, the correct response was 'small amount' whereas incorrect responses included 'large', 'average', or 'not sure'.

Attitude

Different published articles (Kagaruki et al. 2018; Shah, Kamdar, and Shah 2009; Bano et al. 2013; Fatema et al. 2017; Saleh et al. 2012; Yang et al. 2017) were reviewed to generate a total of 12 points to assess the attitudes of RSFCs towards available prevention measures for NCDs including type 2 diabetes and cardiovascular diseases. Participants who agreed with a positive statement concerning prevention measures and those who disagreed with a negative statement were considered as having a positive attitude and were given a score of '1'. Those who reported to disagree with a positive statement and agree with a negative statement were given a score of '0'.

Knowledge and Attitude (K&A) scores

An overall aggregated K&A score of the combined answers to the 36 questions (24 for knowledge and 12 for attitude) per participating RSFCs was obtained.

Knowledge, attitude, combined knowledge and attitude categorization

Individual, absolute scores were summed and converted into percentages. The percentage scores were categorized using the 'Modified Bloom Technique' (Yimer et al., 2014) into two categories: low and good knowledge; negative and positive attitude; low and good combined knowledge and attitude for scores <40% and between 40% and 100%, respectively.

Data analysis

Stata version 15 (STATA Corp Inc., TX, USA) was used for data cleaning and analysis. Simple and multiple linear regression analyses were used to assess factors associated with outcomes of interest. All variables which had a p -value <0.2 in the simple linear analysis were included in the multiple linear model. However, only variables which had a p -value <0.05 were retained in the final model and considered to be statistically significant. The p -value threshold of 0.2 is among the recommended bivariate pre-screening values of candidate explanatory variables to be included in the adjusted analysis models (Zoran, Heath Gauss, and Keith Williams 2008).

Modelling

Linear regression models were used to assess the influence of Knowledge (K), Attitude (A) and combined K&A levels on metabolic risk factors including diastolic blood pressure (BP), systolic BP, body mass index, fasting blood glucose, fasting triglycerides and waist circumference. This statistical modelling technique was also used to assess factors associated with variation in mean percentage attitude, knowledge and both attitude and knowledge scores. Adjusted beta coefficients ($A\beta C$) from multiple linear regression with 95% confidence intervals were reported.

Explanatory variables

Six behavioural items were adopted from published articles and STEPs survey guidelines (Kagaruki et al. 2014; Health and Medical 2013; WHO 2017). These items included attaining weekly recommended Metabolic Equivalent Task-MET (≥ 600 MET), consuming fruits/vegetables 5 days/week, being a non-smoker and/or non-alcohol-drinker, eating outside the home ≤ 7 meals per week and always using vegetable cooking oils at home. Other explanatory variables were socio-economic and demographic factors including age, sex, education, marital status and household income.

Ethical considerations

Methods, relevant guidelines and regulations following the declaration of Helsinki were used throughout the study (Kori-Lindner 2000). This study was approved by both the National Medical Research and Coordinating Committee and the Kilimanjaro Christian Medical University College Review Board and given the approval number NIMR/HQ/R.8a/Vol.IX/2794 and 2291, respectively. Every participant was informed about the aim and objectives of the study and risks and benefits of participating in the study. They were also assured that participation was voluntary and could be stopped at any time, and nobody would be negatively affected for not consenting to participate in the study. Written informed consent was obtained from each participant. Study subjects found to have metabolic risks were advised according to the WHO guidelines (WHO 2007).

Results

Socio-demographic characteristics

Five hundred and sixty (560) eligible participants aged 25–64 years were enrolled in the study. These participants were recruited via street food vendors who were randomly selected. Nearly 58% were male, and their mean age was 42.8 (SD = 11.6) years. More than three-quarters (79%) had a primary level of education. Seventy-six percent were either married or cohabiting. More than half (52%) of participants had a low household monthly income (below the median USD \$ 158.94).

Knowledge on type 2 diabetes and its associated factors

A small proportion (21.7%) of participants knew about risk factors, symptoms and complications of type 2 diabetes as well as about the recommended daily amount of different food groups. Less than 10% mentioned harmful alcohol consumption and excessive body weight as risk factors for type 2 diabetes and less than 20% listed physical inactivity and raised cholesterol as the risk for the problem. Limited knowledge was also observed on the symptoms of the disease, as less than 10% were able to mention frequent thirst, blurred vision and poor wound healing as symptoms for type 2 diabetes. The symptoms such as frequent urination and fatigue were mentioned by less than 40%. Knowledge on health complications associated with the disease was low, as less than 15% were able to mention stroke, blindness and impotence as complications of the disease. About two-quarters of the respondents were aware of the required daily amount of foods from different food groups including vegetables, sugary foods and salty foods (Table 1).

Table 1. Proportion of regular street food consumers with correct knowledge of type 2 diabetes risk factors, symptoms, complications and of food groups ($N = 560$).

Domain	Variable	Number (%)
Risk factors	Physical inactivity	93 (16.6)
	Raised blood glucose	302 (54.0)
	Raised cholesterol	62 (11.0)
	Unhealthy eating habits	265 (46.6)
	Harmful alcohol consumption	50 (8.9)
	Excessive body weight	26 (4.4)
Symptoms	Frequent thirst	49 (7.0)
	Frequent urination	217(37.6)
	Extreme weight loss	86 (15.2)
	Blurred vision	26 (4.6)
	Fatigue	132 (22.8)
	Poor wound healing	50 (9.3)
Complications	Amputation	123(20.8)
	Stroke	29(4.2)
	Blindness	40(7.1)
	Impotence	69(11.9)
Healthy diet (standard amount)	Vegetables	379(66.8)
	Sugary foods	385(68.2)
	Red meat	329(58.2)
	Starchy foods	183(32.5)
	Fatty foods	409(72.7)
	High fibre foods	74(13.8)
	Fruit	65(12.1)
	Salty foods	387(68.4)

The overall mean knowledge score was 28.1% (95% CI: 26.9–29.3%). Multiple regression analysis showed that higher knowledge scores were associated with being in the age group of people between 41- and 64-year olds $A\beta C = 5.8\%$ (95% CI: 3.5–8.1%), having secondary/college education $A\beta C = 7.6\%$ (95% CI: 4.2 to-10.9%) and good income $A\beta C = 2.5\%$ (95% CI: 0.3–4.9%), (Table 3).

Attitudes towards type 2 diabetes prevention

More than three-quarters of the study participants had negative attitudes toward preventative behaviours and agreed with statements such as ‘Regular exercise requires a lot of effort’. The majority also agreed ‘If there is an increased chance of getting diabetes (e.g. having a family history), then there is nothing you can do to prevent or delay the onset of the disease’ and ‘you make little effort to avoid diabetes risk factors’. Over half of the participants had negative attitudes towards positive behaviours for preventing diabetes by agreeing to the statements ‘It is very difficult to avoid overeating if delicious foods are plenty’ and ‘If a person is rich and fat and suddenly becomes thin and slender it is a sign of running bankrupt’ (Table 2).

The overall mean positive attitude score was 49.2% (95% CI: 47.5–50.9%). Multiple regression analysis showed that high positive attitude scores were associated with being female $A\beta C = 4.5\%$ (95% CI: 1.3–7.7%), having secondary/college education $A\beta C = 9.2\%$ (95% CI: 5.1– 13.5%) and being married or cohabiting $A\beta C = 5.3\%$ (95% CI: 1.6–9.0%) Table 3.

Table 2. Negative attitudes of regular street food consumers towards behavioural strategies to prevent metabolic diseases (type 2 diabetes).

Statement	n (%)
It is possible to prevent diabetes by dietary management (disagree or strongly disagree)	58 (10.3)
Family history of diabetes requires leading a disciplined life (disagree or strongly disagree)	82 (14.7)
Obesity increases the risk of diabetes (disagree or strongly disagree)	121 (22.0)
Regular exercise requires a lot of effort (agree or strongly agree)	516 (92.5)
If there is an increased chance of getting diabetes, e.g. having a family history, then there is nothing you can do to prevent or delay the onset of the disease (agree or strongly agree)	421 (75.9)
You make little effort to avoid diabetes risks factors (agree or strongly agree)	421 (74.7)
If a person is rich and fat and suddenly becomes thin and slender, it is a sign of running bankrupt (agree or strongly agree)	306 (55.5)
If somebody is fat, he/she has to maintain his/her body structure; otherwise, he/she could be considered to be HIV positive by others (agree or strongly agree)	299 (55.2)
To become thin and slender is not good because people will consider one to be HIV positive (agree or strongly agree)	235 (43.7)
A glass of unsweetened juice is better than chewing the actual fruit (agree or strongly agree)	294 (52.7)
It is very difficult to avoid overeating if delicious foods are plenty (agree or strongly agree)	356 (64.0)
If foods are low in salt, it is better to add salt when you are eating in order to improve the taste (agree or strongly agree)	268 (48.2)

Table 3. Factors associated with knowledge (K) and attitude (A) scores among regular street food consumers in Dar es Salaam.

Variable	Knowledge		Attitude		Knowledge & attitude	
	UβC 95% CI	AβC 95% CI	UβC 95% CI	AβC 95% CI	UβC 95% CI	AβC 95% CI
Socio-economic and demographic factors						
Sex						
Male	Ref		Ref	Ref	Ref	Ref
Female	1.1 (-1.3 to 3.5)		2.5 (-0.9 to 5.9)	3.6 (0.2 to 7.1)	1.5 (-0.5 to 3.6)	3.0 (1.1 to 5.0)
Age group (years)						
25-40	Ref		Ref		Ref	Ref
41-64	5.3 (2.9 to 7.6)	5.8 (3.5 to 8.1)	-0.1 (-3.5 to 3.2)		3.5 (1.5 to 5.5)	3.9 (1.9 to 5.9)
Education						
None/primary	Ref	Ref	Ref	Ref	Ref	Ref
Secondary/college	7.1 (3.7 to 10.5)	7.6 (4.2 to 10.9)	10.1 (5.8 to 14.4)	10.4 (6.5 to 14.4)	8.1 (5.3 to 11.0)	8.4 (5.6 to 11.1)
Marital status						
Married/cohabiting	2.2 (-0.5 to 4.8)		4.8 (1.2 to 8.4)	6.0 (2.2 to 9.8)	3.0 (0.8 to 5.3)	3.0 (0.8 to 5.2)
Others	Ref		Ref	Ref	Ref	Ref
Household monthly income						
Low	Ref	Ref	Ref	Ref	Ref	Ref
High	3.1 (0.7 to 5.6)	2.5 (0.3 to 4.9)	2.8 (-0.6 to 6.2)		3.0 (1.0 to 5.1)	2.4 (0.5 to 4.4)
Family risk						
Family history of diabetes						
Yes	1.9 (-1.0 to 4.7)	1.3 (-1.4 to 4.0)	1.4 (-2.2 to 5.0)		1.7 (-0.6 to 4.0)	0.7 (-1.5 to 2.9)
No	Ref	Ref	Ref		Ref	Ref
Behavioural risks						
Smoking						
Current/ex-smoker	Ref		Ref		Ref	
Non-life smoker	1.1 (-2.3 to 4.4)		0.8 (-3.4 to 5.0)		1.0 (-1.7 to 3.7)	
Alcohol						
Current/ex-drinker	Ref		Ref		Ref	Ref
Non-life drinker	1.1 (-1.6 to 3.7)		2.4 (-1.1 to 5.9)		1.5 (-0.7 to 3.7)	-0.1 (-2.2 to 2.0)

(Continued)

Table 3. (Continued).

Variable	Knowledge		Attitude		Knowledge & attitude	
	U β C 95% CI	A β C 95% CI	U β C 95% CI	A β C 95% CI	U β C 95% CI	A β C 95% CI
Physical activity						
<600 MET/week	Ref		Ref		Ref	
\geq 600 MET/week	-1.9 (-4.6 to 0.7)		-4.0 (-7.7 to -0.2)	-3.2 (-6.9 to 0.5)	-2.6 (-4.9 to -0.3)	-1.7 (-3.9 to 0.5)
Home cooking oils						
Mixed oil	Ref		Ref		Ref	
Vegetable oil	0.8 (-1.8 to 3.4)		1.2 (-2.3 to 4.8)		1.0 (-1.2 to 3.2)	
Fruits/vegetables						
<5 days/week	Ref		Ref		Ref	
5+ days/week	-0.5 (-3.2 to 1.9)		-3.0 (-6.5 to 0.5)		-1.4 (-3.5 to 0.8)	
Meals eaten outside						
3-7 meals/week	Ref		Ref		2.0 (-0.4 to 4.4)	0.5 (-1.7 to 2.8)
8-28 meals/week	1.9 (-0.9 to 4.7)		2.2 (-1.5 to 5.9)	-3.1 (-6.5 to 0.3)	Ref	Ref

U β C: unadjusted beta coefficients; A β C: adjusted beta coefficients.

Combined knowledge and attitude scores

The overall combined mean score of knowledge and attitude was 35.1% (95% CI: 34.1–36.2%). Multiple regression analysis showed that high knowledge and attitude scores were associated with being female $A\beta C = 3.0\%$ (95% CI: 1.1–5.0%) and being aged between 41 and 64 years $A\beta C = 3.9\%$ (95% CI: 1.9–5.9%). Other significant factors were having secondary/college education levels $A\beta C = 8.4\%$ (95% CI: 5.6–11.1%), being married or cohabiting $A\beta C = 3.0\%$ (95% CI: 0.8–5.2%) and having high income $A\beta C = 2.4\%$ (95% CI: 0.5–4.4%), [Table 3](#).

Association between knowledge, attitude and metabolic risks factors

The prevalence rate of low knowledge, negative attitude, and combined limited knowledge and negative attitude were 78.3%, 32.0% and 68.8%, respectively ([Figure 1](#)). Adjusted multiple regression analysis shows that low knowledge was protective as it was associated with decreased fasting blood glucose (BG) $A\beta C = -0.4$ mmol/L (95% CI: -0.8 to -0.1 mmol/L), decreased body mass index $A\beta C = -1.3$ kg/m² (95% CI: -2.3 to -0.2 kg/m²) and decreased waist circumference $A\beta C = -3.8$ cm (95% CI: -6.7 to -0.9 cm). Results also show that decreased fasting BG $A\beta C = -0.3$ mmol/L (95% CI: -0.5 to -0.04 mmo/L), decreased body mass index $A\beta C = -1.1$ cm (95% CI: -2.1 to -0.1 cm) and decreased waist circumference $A\beta C = -4.0$ cm (95% CI: -6.8 to -1.1 cm) were associated with combined good knowledge and attitude level ([Table 4](#)).

Discussion

We aimed to estimate the level of knowledge and attitudes towards strategies for preventing NCDs including type 2 diabetes and their determinants as well as assessing associations between knowledge and attitude levels and metabolic risk factors among RSFCs. This study has shown low knowledge and negative attitude towards strategies for

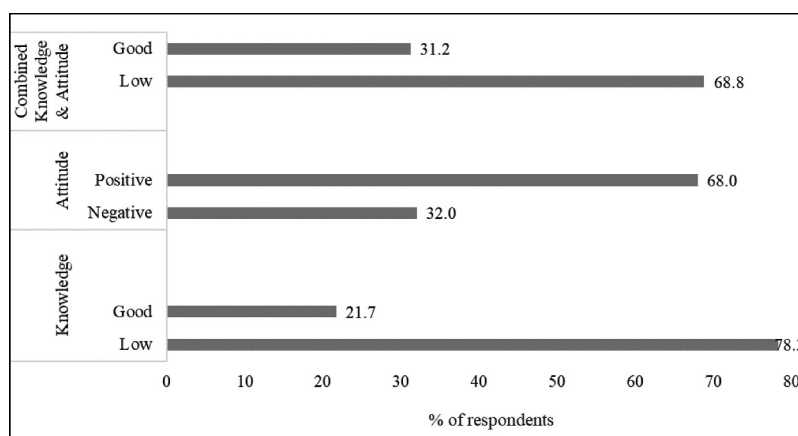


Figure 1. Respondents and their level of knowledge and attitude ($n = 560$).

Table 4. Association between metabolic risk factors, knowledge, and attitude using multiple linear regression.

Variable	Diastolic BP (mmHg)		Systolic BP (mmHg)		Fasting FBG (mmol/L)	
	U β C, 95% CI	A β C, 95% CI	U β C, 95% CI	A β C, 95% CI	U β C, 95% CI	A β C, 95% CI
Knowledge						
Low	-1.4 (-4.2 to 1.3)	Ref	-3.1 (-7.7 to 1.5)	Ref	-0.5 (-0.9 to -0.2)	-0.4 (-0.8 to -0.1)
Good	Ref	Ref	Ref	Ref	Ref	Ref
Attitude						
Negative	0.3 (-2.3 to 2.8)	Ref	3.9 (-0.2 to 8.0)	2.1 (-0.2 to 6.2)	-0.1 (-0.3 to 0.2)	Ref
Positive	Ref	Ref	Ref	Ref	Ref	Ref
Knowledge & attitude						
Low	-1.8 (-4.4 to 0.7)	Ref	-1.2 (-5.4 to 2.9)	Ref	-0.4 (-0.6 to -0.13)	-0.3 (-0.5 to -0.04)
Good	Ref	Ref	Ref	Ref	Ref	Ref

Adjustment made for sex, age, education, marital status and income level and diabetes family history. BG: blood glucose; TG: triglycerides; CI: confidence interval; A β C: adjusted beta coefficients. *p*-values: * <0.05 , ** <0.01 and *** <0.001 , inadequate ($<40\%$) and adequate ($40\text{--}100\%$) and adjusted beta coefficients (U β C).

preventing NCDs including type 2 diabetes among RSFCs. Low level of knowledge observed among RSFCs may signify that they are less likely to practice recommended prevention strategies, and they are more likely to be diagnosed late, a situation which leads to poor treatment outcomes and financial burden at the household level and the health system at large (Gurmu et al. 2018; Ferber, Von, and Hauner 2007; Rui et al. 2013; Corrina et al. 2019). Studies also indicate that negative attitudes towards NCDs including type 2 diabetes prevention strategies are barriers which hinder consumption of a balanced diet (Chege et al. 2015; Kinabo 2003).

This study indicates that, a small proportion of RSFCs had good knowledge on type 2 diabetes. However, those with combined good knowledge and attitudes had increased blood glucose, higher body mass index and increased waist circumference. Unexpectedly, a combined low knowledge and positive attitude level was associated with decreased blood glucose, decreased body mass index and decreased waist circumference. Similar findings were observed in China (Zhou et al. 2017). This may signify that having adequate knowledge and positive attitude towards NCDs including type 2 diabetes is not sufficient in our study population to influence health outcomes such as increased blood glucose, raised blood pressure and overweight/obese. On the other hand, attitude towards strategies for preventing type 2 diabetes was negative in many aspects. For example, the majority of respondents acknowledged that regular exercises take a lot of efforts and believed that if there is a family history of diabetes, then there is nothing that can be done to prevent or delay occurrence of the disease. The majority also declared that they make little efforts to avoid diabetes risk factors. Evidence indicates that RSFCs are at increased risk of NCDs due to unhealthy eating practices which is linked to having limited knowledge on nutritional values of foods (Lopes Nonato et al. 2016). Our study in Dar es Salaam reveals similar findings and documents low levels of knowledge on type 2 diabetes, especially on its risk factors, symptoms and complications. We also observed that type 2 diabetes knowledge and combined knowledge and attitude were associated with socio-demographic factors including age, sex and education; similar results were reported elsewhere (Fatema et al. 2017; Fenwick et al. 2013). Studies have indicated that people with good knowledge are more likely to be able to reduce metabolic risk factors, including increased blood glucose, high body mass index, increased cholesterol level and high blood pressure (Yang et al. 2017; Priyanwada et al. 2016).

Contrary to the above studies, our study has shown that participants with adequate knowledge had increased metabolic risk factors including increased fasting blood glucose, high body mass index and increased waist circumference. This may imply that participants with good knowledge acquired the knowledge after having the risks. Such situation indicates gaps in NCD awareness creation in the community.

In this study, those who had good knowledge were better educated and had higher income. These are more likely to have higher purchasing power and thus can afford better health care, so are more likely to get advice. Other studies in Tanzania, South Africa and Senegal show that being overweight/obese is a stigma avoidance strategy of the diseases associated with weight loss such as HIV, thus preventing people from changing unhealthy eating (Kagaruki et al. 2018; Hurley et al. 2011).

The findings from this study may further suggest that most of the participants with good knowledge had already been diagnosed with the problem; hence, they had been exposed to prevention education which is mandatory according to the national treatment

guidelines (URT 2013). Despite being knowledgeable they were not translating the knowledge into practice. Our argument is in line with the findings from studies conducted in Bangladesh which revealed that type 2 diabetes participants had higher knowledge than non-diabetes individuals (Fatema et al. 2017; Mumu et al. 2014). Our findings may also imply that the focus on providing health education is inclined to people already diagnosed with the problem than the general population. Therefore, to reach both healthy and unhealthy individuals, NCDs prevention programs should target the general population.

Our study has documented negative attitudes towards potential strategies for preventing type 2 diabetes. The majority of participants showed a negative attitude towards improving health and reducing CVD risk factors in their daily life. This became apparent when 60% of study participants reported that they could not resist delicious foods, consider efforts to avoid getting diabetes when having a family history futile and want to avoid social stigma linked to weight loss. Nevertheless, our study documented responses with promising opportunities for NCD prevention. The majority of the participants perceived that it is possible to prevent diabetes by dietary management. They also acknowledged that family history of diabetes should mean following a disciplined life and obesity increases the risk of diabetes.

Strengths and limitations

This study met its objective of generating an understanding of the level of knowledge and attitude towards type 2 diabetes among RSFCs. However, this study is limited due to the fact that it was conducted in one region of Dar es Salaam among 25 regions in the country and in an urban setting. Therefore, the findings cannot be generalized to the rural settings and the entire country.

Conclusion

Among our study participants, knowledge is low, and attitudes are negative towards preventative measures for type 2 diabetes among RSFCs. Furthermore, having adequate knowledge and positive attitude towards NCDs including type 2 diabetes did not influence risk factors for type 2 diabetes such as increased blood glucose, raised blood pressure and overweight/obese. We recommend awareness campaigns and interventions that can influence behavioural change among RSFCs and vendors for type 2 diabetes prevention.

Abbreviations

A β C: Adjusted beta coefficients, BG: Blood Glucose, BMI: Body Mass Index, BP: Blood Pressure, CI: Confidence Interval, CVD: Cardiovascular Diseases, DE: Design Effect, K & A: Knowledge and Attitude, MET: Metabolic Equivalent Task, NCD: Non-communicable Diseases, NIMR: National Institute for Medical Research, ODK: Open Data Kit, SD: Standard Deviation, TG: Triglycerides, U β C: Unadjusted Beta Coefficients and WHO: World Health Organization.

Author's Contributors

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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