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RESEARCH PAPER

Perceptions of risk of coronary heart disease among people living with type 2 diabetes mellitus

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Abstract

Aims: Our aim is to assess perception of risk of developing coronary heart disease and to examine its associations with individuals' characteristics and health behaviours among Omani people with type 2 diabetes mellitus (T2DM).

Background: Evaluating perceptions of being at risk of developing a disease may give insight into health promotion behaviours. People with diabetes are at high risk of coronary heart disease. The management of diabetes mellitus should include prevention and control of coronary heart disease.

Design: A cross-sectional correlational study was conducted.

Methods: A convenience sample of 160 adults with T2DM was invited to participate in this study between November 2014 and March 2015. Descriptive and regression analyses were performed to examine associations between study variables.

Results: Perception of risk of developing coronary heart disease was significantly associated with low educational level (β = 0.191, P < .05), low income (β = 0.201, P < .05), and high level of knowledge about diabetes mellitus (β = 0.200, P < .05). People with T2DM who perceived coronary heart disease as having few moderate known outcomes and consequences reported consuming healthy diet more frequently.

Conclusion: Teaching people with T2DM about the risk of developing coronary heart disease is essential as it could motivate them to perform health promotion behaviours, which may assist in controlling and reducing coronary heart disease.

KEYWORDS

coronary disease, diabetes mellitus, health behaviour, Oman, perceptions, risk

SUMMARY STATEMENT

What is already known about this topic?

- Perception of risk of developing heart disease plays a major and important role in adopting healthy behaviours.
- Individuals who do not perceive themselves at risk of developing heart disease would be less likely to assume healthy behaviours.
- Given the high risk of heart disease in people with diabetes, it is important to identify factors that may affect their perceptions of risk of developing coronary heart disease.

What this paper adds?

- Adult Omani people with T2DM had a medium perception of risk of developing coronary heart disease.
- Low perception of risk of developing coronary heart disease was significantly associated with high level of education, high income, male gender, short duration of diabetes mellitus, and low knowledge about diabetes mellitus.
- Consuming healthy diet (as a health promotion behaviour) was reported more often among people with T2DM who perceived coronary heart disease as having few moderate known outcomes and consequences.

The implications of this paper:

- Nurses should educate people with T2DM about the risk of developing coronary heart disease, so they can carry out appropriate health behaviours to control and reduce its occurrence.
- Nurses should consider multiple strategies designed to counsel, motivate, and encourage people with T2DM to learn about diabetes mellitus and its complications.
- Further research with randomized controlled trials is warranted to evaluate the effectiveness of newly developed risk communication protocols that target coronary heart disease risk perceptions and intentions to change lifestyle behaviours among people with T2DM.

1 | INTRODUCTION

According to the World Health Organization (WHO) (2014), coronary heart disease (CHD) is the leading cause of death for both men and women, killing more than 7 million people every year. Diabetes mellitus (DM) is a major risk factor for CHD. The global prevalence of DM is 9%, and it is projected to be the seventh leading cause of death in 2030 (WHO, 2016). Positive associations between CHD and DM have been well documented in the literature (Bowden et al, 2010; de Ferranti et al, 2014; Fox et al, 2015; Hauk, 2016). People with DM are twice as likely to have heart disease than people without DM (Centers for Disease Control and Prevention, 2016). In Oman, CHD is the leading cause of death followed by DM, and CHD is often seen in conjunction with DM. As the prevalence of type 2 DM (T2DM) is increasing among Omani population, CHD will also rise (WHO, 2015).

Risk perception is formed through appraisal of life experiences and is influenced by variables such as age, gender, level of education, experiences, and knowledge (Ammouri, Neuberger, Mrayyan, & Hamaideh, 2011; King et al, 2002; McSweeney et al, 2016; Moore, Kimble, & Minick, 2010; Weinstein & Nicolich, 1993). Assessing perceptions of being at risk of developing a disease may give insight into health promotion behaviours. In DM, CHD, and other chronic illnesses, perceptions have been shown to be highly associated and influential to behaviours (Allen, Purcell, Szanton, & Dennison, 2010; Hampson, 1997; Hart, 2005; Scharloo & Kaptein, 1997). Individuals who did not perceive themselves at risk of developing CHD were less likely to assume healthy behaviours to prevent or control it (Ammouri & Neuberger, 2008; King et al, 2002).

Both adequate management of CHD risk factors as well as promoting healthy behaviours in people with diabetes are imperative (Chiuve, McCullough, Sacks, & Rimm, 2006; Diabetes Prevention Program Research Group, 2015). Evidence on people with diabetes suggests that controlling CHD risk factors was critical for reducing the risk of developing CHD and for maintenance of health by securing optimal glucose levels (American Diabetes Association, 2017a, 2017b; Reaven, 2002).

Knowledge about a potential risk of a disease may be a necessary first step in taking an action to reduce the occurrence of such disease. As reported by the American Diabetes Association (2017b), the management of T2DM should include prevention of CHD. A study conducted by Wagner, Lacey, Abbott, de Groot, and Chyun (2006) found that people with DM had lower level of knowledge about their risk for heart disease. They suggested that education must begin before initiating pharmacotherapy for CHD risk factors. In the same light, the American Diabetes Association emphasized in its clinical practice recommendations that the cardiovascular burden of diabetes has still not been effectively communicated to patients with diabetes as well as to healthcare providers (American Diabetes Association, 2017b).

Due to the high risk of developing CHD in people with T2DM, it is important to identify factors that may affect their perceptions of risk of developing CHD. Unfortunately, despite the rising incidence of T2DM globally and in Oman, the literature indicates that there is a worldwide dearth of evidence regarding risk perceptions of CHD among people with T2DM, and no previous studies conducted in Oman address this clinical issue.

1.1 | Conceptual framework

Pender's health promotion model (HPM) was used to examine perception of risk of developing CHD and health promoting behaviours among people with T2DM in Oman. Pender's HPM includes 2 groups of factors, which include (a) individual characteristics and experiences and (2) behaviour-specific cognitions and affect (Figure 1). The model shows that these 2 groups of factors have both indirect and direct effects on health promotion behaviours (Pender, Murdaugh, & Parsons, 2011). As HPM indicates, an individual is probably going to engage in health promotion behaviour if he or she perceives himself or herself at risk of a serious disease. The perceived risk of developing

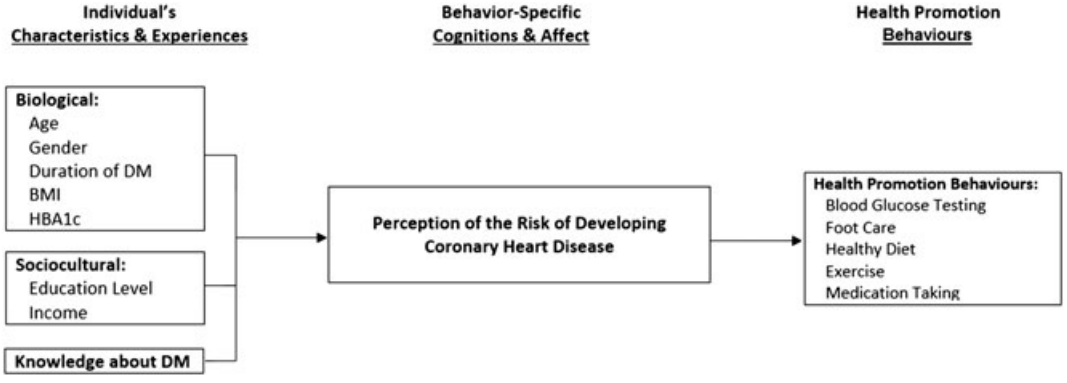

FIGURE 1 Conceptual framework for associates to perception of risk of developing coronary heart disease (CHD)

CHD has been associated with the desire to make risk-reducing behavioural changes. Based on HPM, individuals' characteristics and knowledge about DM can improve the likelihood of adopting health promotion behaviours by modifying perception of risk of developing CHD.

2 | METHODS

2.1 | Aims

This study aimed to assess the level of perception of risk of developing CHD and to examine its associations with other variables including individuals' characteristics (such as age, gender, education, income, body mass index [BMI], duration of DM, and glycosylated haemoglobin [HBA1c]), DM knowledge, and health promotion behaviours (such as consuming a healthy diet, weight control, regular exercise, and not smoking).

2.2 | Design

A cross-sectional correlational design was used.

2.3 | Sample

Patients who met the following criteria were invited to participate: (a) an Omani adult diagnosed with T2DM for at least 2 years, (b) on oral hypoglycaemic medications, (c) able to understand and communicate in Arabic or English languages, (d) not diagnosed with CHD, and (e) able to provide informed consent. Being treated with insulin was an exclusion criterion, as the perceptions of CHD might differ according to treatment regimen.

Using convenience sampling, 160 adult patients diagnosed with T2DM were invited to participate in this study between November 2014 and March 2015. A sample size analysis was conducted by using Cohen's power table for a regression analysis modelling with 8 independent variables (Cohen, 1992). One hundred and seven patients would be required to achieve 80% power in detecting a medium effect size (f = 0.25), at the 5% level of significance. Accordingly, a targeted sample size of 160 participants was adequate, assuming a 25% nonresponse rate.

2.4 | Data collection

All participants were recruited at the diabetes clinic of the outpatient department of a university teaching hospital located in Muscat, the capital city of Oman. The hospital provides a full range of healthcare services for patients admitted from all socioeconomic levels across the country; this increases the representative nature of study results, in relation to the general public population with diabetes in the country. All patients with diabetes regularly attend the outpatient department. As per the approved study protocol, the research team was provided access to patient medical records at the outpatient diabetes clinic.

Invitation letters to potential participants with information about our study were sent to all physicians for circulation to patients with T2DM. Further, advertisements about the study were posted on announcement boards and fliers were distributed within the other outpatient clinics. The research team approached adults with T2DM who expressed interest to take part in this study to ensure that they meet the eligibility criteria.

2.5 | Instruments

The individuals' characteristics (such as age, gender, education, duration of DM, income, smoking status, BMI, and HBA1c) were collected by using an instrument developed by the research team. The BMI was calculated based on the participants' weight and height measurements by using the following formula: BMI = [weight (kg)/height (m^2)]. It then was categorized based on the WHO classification: underweight (BMI < 18.5 kg/m^2), normal weight (18.5-24.9 kg/m^2), overweight (25-29.9 kg/m^2), or obese (≥30 kg/m^2) (WHO, 2017). The HbA1c value reflects the average level of blood glucose over the last 3 months. Thus, it was considered the primary indicator of whether these participants with diabetes had maintained control of their blood glucose levels over the 3 months preceding recruitment into this study. The HbA1c value was categorized as either uncontrolled (inadequate glycaemic control) if HbA1c value was ≥7%, or controlled (adequate glycaemic control) if HbA1c value was <7% (American Diabetes Association, 2014). The HbA1c was analysed by using a high-performance chromatography method (Bio-Rad).

The Diabetes Knowledge Test (DKT) developed by the Michigan Diabetes Research Training Centre (1998) was used to assess the knowledge about DM among study participants. The DKT has 23 items that focus on general knowledge about DM. Each item has 3 to 4 options with only 1 correct response. Total scores were calculated by summing total number of correct answers (with possible range of 0-23); the higher the score, the higher the level of knowledge. The scale was documented as having sufficient validity and reliability (Fitzgerald et al, 1998).

The Perception of Risk of Heart Disease Scale (PRHDS) (Ammouri & Neuberger, 2008) was used to measure perception of risk of developing CHD. The PRHDS is a 20-item questionnaire composed of 3 subscales "dread risk," "risk," and "unknown risk." Figure 2 shows the items under each subscale. Each item has 4-point Likert scale response options, ranging from 1 (strongly disagree) to 4 (strongly agree). Item scores are summed for each subscale separately, as well as across subscales for a total scale score. Reverse scoring of negative-response items is required. Higher scores indicate a higher perception of risk of developing CHD. The "dread risk" subscale identifies participants who perceive CHD as *lack of control*, *catastrophic potential*, *dread*, *and fatal consequences*. The "risk" subscale identifies participants who perceive CHD as *having few moderate known outcomes and consequences*. The "Unknown risk" subscale identifies participants who perceive CHD as *unknown*, *new*, *unobservable*, *and delayed in their manifestation of harm*.

Test-retest and internal consistency reliabilities for the PRHDS were 0.71 and 0.80, respectively (Ammouri & Neuberger, 2008). Cronbach alpha coefficient for internal consistency reliability for the Arabic version was 0.79 for the total scale, 0.79 for "dread risk"

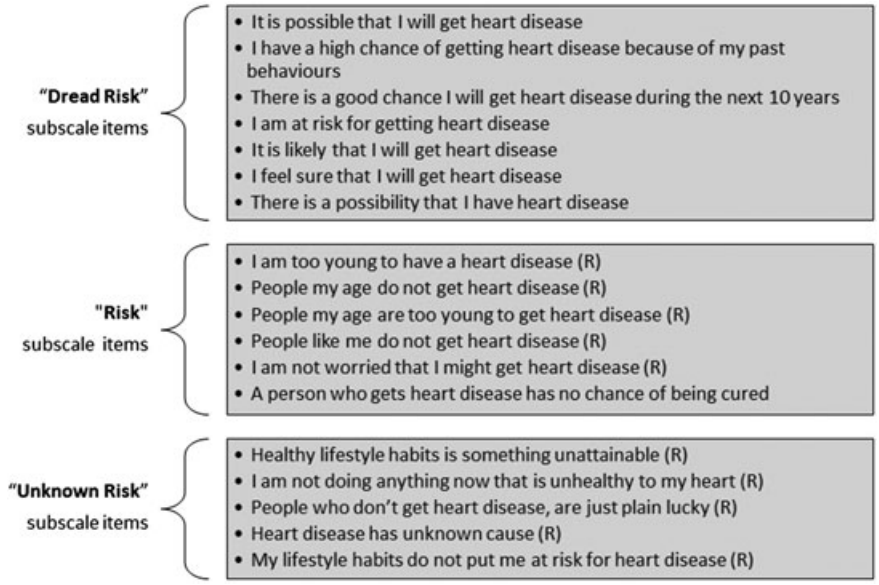

FIGURE 2 Subscales and items of Perception of Risk of Heart Disease Scale (PRHDS)

subscale, 0.72 for "risk" subscale, and 0.65 for "unknown risk" subscale (Ammouri et al, 2011).

Health promotion behaviours were assessed by using the Summary of Diabetes Self-Care Activities Scale [SDSCA]. The SDSCA is a self-report scale to measure frequency of carrying out self-care tasks. It consists of several subscales including blood glucose testing, foot care, diet, exercise, and medication taking. The SDSCA asks the participants to state the number of days in the last 7 days in which they performed each self-care activity. Scores of the SDSCA scale represent mean number of days for each subscale; higher scores indicate higher levels of performance of self-care. Internal consistency using Cronbach alpha for the SDSCA exceeds 0.80; test-retest reliability ranges from 0.75 to 0.84 (Toobert, Hampson, & Glasgow, 2000). Cronbach alpha coefficient for internal consistency reliability for the Arabic version was 0.81 (Al-Khawaldeh, Al-Hassan, & Froelicher, 2012).

2.6 | Psychometric properties of study instruments

In our study, Cronbach alpha coefficient for internal consistency reliability was 0.81 for DKT. In relation to the PRHDS scale, the Cronbach alpha coefficients for internal consistency reliability were 0.81 for the total score, 0.80 for "dread risk" subscale, 0.78 for "risk" subscale, and 0.71 for "unknown risk" subscale. Furthermore, the Cronbach alpha reliability coefficient for the SDSCA scale was 0.83.

2.7 | Ethical considerations

The Ethics and Research Committee of a governmental university approved the study protocol (ref IG/CN/14/02). Before collecting written consents, each study participant was provided with full information about study aims along with potential risks and benefits of participation. The participants were assured that participation is voluntary and they can withdraw at any time. Data confidentiality was maintained by assigning code numbers, instead of names, to our study data files. Data files and informed consents were kept in separate locked cabinets in the research office.

2.8 | Data analyses

Statistical analyses were performed by using the IBM SPSS Statistics 25. Descriptive statistics of demographic and clinical characteristics (means, standard deviations, frequencies, and percentages) were populated to describe the sample. Multiple regression analyses were used to assess associations between individuals' characteristics, knowledge about DM, perception of risk of developing CHD, and health promotion behaviours. A $P \leq .05$ was set as the threshold for statistical significance for all tests.

3 | RESULTS

Only 140 of 160 participants who met the inclusion criteria completed the questionnaire, yielding a response rate of 88%. The demographic characteristics of the sample are summarized in Table 1. The mean age of study participants was 53.2 years (±11.8), and 65% were men. Around 68% of the participants completed at least high school education, and 57% had an income of ≥500 OMR (1 Omani Riyal equals 2.59 US Dollars). Forty-one percent of the participants were overweight, and 22% were obese. Further, the mean score for total PRHDS was 48.9 (possible range: 20-80).

3.1 | Analysis of Perception of Risk of Heart Disease Scale responses

Analyses of the responses to PRHDS items showed that, for the "dread risk" subscale, 33.2% of the participants perceived CHD as lack of control, catastrophic potential, dread, and fatal consequences. For the "risk" subscale, 56.1% perceived CHD as having few moderate known outcomes and consequences. For the "unknown risk" subscale, 50.8%

TABLE 1 Descriptive of study variables (n = 140)

Variable	Mean (SD)	Frequency (%)	Actual Range	Possible Range
Age	53.25 (11.84)		25-75	
30-39		11 (7.9)		
40-49		37 (26.4)		
50-59		68 (48.6)		
≥60		24 (17.1)		
Gender				
Male		91 (65.0)		
Female		49 (35.0)		
BMI	26.43 (4.45)			
<18.5		1 (0.7)		
18.5-24.9		50 (35.7)		
25-29.9		58 (41.4)		
≥30		31 (22.1)		
Education level				
No formal education		13 (9.3)		
Primary school		12 (8.6)		
Secondary school		20 (14.3)		
High school		31 (22.1)		
Diploma degree		26 (18.6)		
Baccalaureate degree		33 (23.6)		
Graduate degree		5 (3.6)		
Income				
<500 OMR†		60 (42.8)		
≥500 OMR		80 (57.2)		
Smoking status				
Yes		51 (36.4)		
No		89 (63.6)		
Duration of DM				
≤4 years		114 (81.4)		
≥5 years		26 (18.6)		
Knowledge about DM	9.36 (2.93)		3-17	0-23
HbA1c	8.09 (1.09)		5.5-13.4	
Controlled (<7%)		3 (2.1)		
Uncontrolled (≥7%)		137 (97.9)		
Total scores PRHD	48.89 (4.96)		34-66	20-80
Dread	15.70 (3.18)		7-26	7-28
Risk	15.5 (2.06)		10-23	6-24
Unknown risk	17.69 (2.23)		14-25	7-28

†OMR: Omani Riyal (1 Omani Riyal equals 2.59 US Dollars).

perceived CHD as unknown, new, unobservable, and delayed in the manifestation of harm.

3.2 | Associations between individual characteristics and total Perception of Risk of Heart Disease Scale scores

Participants with high educational level (F = 2.884, P = .01) and who had high income (F = 5.917, P = .02) had significantly lower total PRHDS scores. Table 2 summarizes associations between total PRHDS scores and individual characteristics.

3.3 | Associations between health promotion behaviours and Perception of Risk of Heart Disease Scale scores

As shown in Table 3, study findings indicated that the "risk" subscale was significantly, positively associated with consuming a healthy diet (β = 0.275, [95% CI: 0.061, 0.316], P < .05). Patients with T2DM who had stronger perception of CHD as having few moderate known outcomes and consequences reported consuming healthy diet more frequently. The total variance in consumption of healthy diet behaviours accounted for 6% of the perception of risk of developing CHD. Meanwhile, the "dread" and "unknown risk" subscales had no significant associations with health promotion behaviours.

TABLE 2 Associations between individual characteristics with total Perception of Risk of Heart Disease Scale (PRHDS) scores

Variable	n	Min	Max	Mean	SD	F	P
Age							
30-39	11	42	54	48.6	3.8	0.656	.58
40-49	37	34	57	48.0	5.0		
50-59	68	39	66	49.2	5.2		
≥60	24	43	59	49.5	4.7		
Gender							
Male	91	39	59	49.3	4.5	4.282	.07
Female	49	34	66	50.1	5.6		
BMI							
<18.5	1	54	54	54.0	0.0	0.410	.75
18.5-24.9	50	39	59	48.8	4.6		
25-29.9	58	34	62	49.1	4.8		
≥30	31	40	66	48.6	5.9		
Education level							
No formal education	13	45	62	53.3	5.7	2.884	.01
Primary school	12	46	56	50.5	3.3		
Secondary school	20	34	59	47.2	5.7		
High school	31	42	66	49.2	5.3		
Diploma degree	26	39	54	47.7	3.9		
Baccalaureate degree	33	40	56	48.4	4.5		
Graduate degree	5	44	52	48.2	3.5		
Income							
<500 OMR†	60	34	62	50.1	5.3	5.917	.02
≥500 OMR	80	40	66	48.0	4.6		
Smoking status							
Yes	51	40	59	48.6	4.5	0264	.61
No	89	34	66	49.1	5.2		
Duration of DM							
≤4 years	114	34	62	48.7	4.7	0.829	.36
≥5 years	26	43	66	49.7	5.9		
HbA1c							
Controlled (<7%)	3	44	56	48.3	6.6	0.039	.84
Uncontrolled (≥7%)	137	34	66	48.9	4.9		

†OMR: Omani Riyal (1 Omani Riyal equals 2.59 US Dollars).

TABLE 3 Associations between health promotion behaviours and Perception of Risk of Heart Disease Scale (PRHDS) scores

	Total PRHDS		Dread		Risk		Unknown Risk	
Variable	*β*	*t*-value	*β*	*t*-value	*β*	*t*-value	*β*	*t*-value
SDSCA total score	0.115	1.23	0.004	0.05	0.070	0.72	0.091	0.95
Blood glucose testing score	0.123	1.46	0.145	1.63	−0.064	−0.07	0.128	1.35
Foot care	0.022	0.25	−0.069	−0.67	0.022	0.23	0.084	0.88
Diet	0.093	1.11	0.039	0.45	0.275	2.21*	0.102	1.11
Exercise	0.014	1.60	0.009	0.10	0.057	0.06	−0.063	−0.66
Medication taking	0.086	1.02	−0.028	−0.31	0.030	0.30	0.151	1.60

*$P < .05$.

3.4 | Predictors of Perception of Risk of Heart Disease Scale scores

Multiple linear regression analyses were conducted to examine the associations between perceptions of risk of developing CHD with individuals' characteristics and DM knowledge. The combination of these variables in the model was significantly related to total PRHDS scores ($R^2 = 0.146$, $F(7,132) = 3.22$, $P < .01$) (Table 4). After adjusting for other variables in the model, *high* education level was significantly associated with *lower* total score of PRHDS ($\beta = -0.191$, [95% CI: −0.926, 0.069], $P < .05$) and *lower* score of the "risk" subscale ($\beta = -0.242$, [95% CI: −0.531, −0.102], $P < .01$) (i.e., the higher the education level, the lower the perception of CHD as having few moderate known outcomes and consequences).

Omani patients with T2DM with *high* income had *lower* total scores of PRHDS ($\beta = -0.201$, [95% CI: −3.511, −0.177], $P < .05$) and *lower* scores for the "dread" subscale ($\beta = -0.306$, [95% CI: −3.098, −0.952], $P < .001$) (i.e., the higher the income, the lower the perception of CHD as lack of control, catastrophic potential, dread, and fatal consequences). Meanwhile, Omani patients with T2DM *for at least 5 years* had *higher* scores for the "risk" subscale ($\beta = 0.211$, [95% CI: 0.005, 0.265], $P < .05$).

Higher level of knowledge about DM was significantly associated with (a) *higher* total score of the PRHDS ($\beta = 0.200$, [95% CI: 0.043, 0.650], $P < .05$), (b) *higher* scores for the "risk" subscale ($\beta = 0.201$, [95% CI: 0.004, 0.255], $P < .05$), and (c) *higher* scores for the "unknown risk" subscale (i.e., perceiving CHD as unknown, new, unobservable, and delayed in their manifestation of harm) ($\beta = 0.269$, [95% CI: 0.050, 0.276], $P < .05$). The total variance in perception of risk of CHD accounted for by the variables in the regression model was 14% (Table 4).

4 | DISCUSSION

Despite that DM is a major risk factor for CHD, overall, Omani adult people with T2DM had medium perception of risk of developing CHD. This is consistent with the literature (Choi, Rankin, Stewart, & Oka, 2008; King et al, 2002; McSweeney et al, 2016; Moore et al, 2010). Studies conducted among Omanis (Al Bimani, Khan, & David, 2015; Ganguly, Al-Shafaee, & Al-Maniri, 2008) suggested that adults with sedentary lifestyle, DM, and hypertension should be considered at high risk for developing CHD. Low perception of risk is a strong motivator to make education about the risk of developing CHD a

TABLE 4 Multiple regression analysis of Perception of Risk of Heart Disease Scale (PRHDS) scores on set of study variables

	Total PRHDS†		Dread‡		Risk§		Unknown Risk¶	
Variable	*β*	*t*-value	*β*	*t*-value	*β*	*t*-value	*β*	*t*-value
Age	0.115	1.37	0.591	1.01	0.087	0.98	0.050	0.54
Gender	0.083	0.92	−0.007	−0.08	0.124	1.36	0.079	0.84
BMI	0.051	0.60	0.092	1.08	−0.018	−0.21	−0.001	−0.01
Level of education	−0.191	−2.01*	−0.130	−1.51	−0.242	−2.79**	0.080	0.88
Income								
≥500 OMR	−0.201	−2.21*	−0.306	−0.31***	0.061	0.72	−0.024	−0.27
Duration of DM								
≥5 years	−0.022	−0.25	−0.084	−0.94	0.211	2.14*	0.059	0.62
HbA1c	0.027	0.33	0.031	0.37	−0.032	−0.39	0.045	0.53
Knowledge about DM	0.200	2.25*	0.092	1.03	0.201	2.16*	0.269	2.10*

†$F(7,132) = 3.22$, $P < .01$, $R^2 = 0.146$.

‡$F(7,132) = 3.19$, $P < .01$, $R^2 = 0.145$.

§$F(7,132) = 3.03$, $P < .01$, $R^2 = 0.156$.

¶$F(7,132) = 0.88$, $P = .535$, $R^2 = 0.050$.

*$P < .05$.

**$P < .01$.

***$P < .001$.

priority for Omani people withT2DM, who are treated by oral hypoglycaemic medications. The American Heart Association's campaign "Go Red for Heart Disease" may serve as a guide to increase risk perception about heart disease and diabetes (American Heart Association, 2017).

Surprisingly, contrary to studies conducted in other countries (Christian, Mochari, & Mosca, 2005; Frijling et al, 2004), our study findings indicated that in people with T2DM, high income and education levels were negatively associated with perception of risk of developing CHD. Higher levels of income are usually associated with more education, and low perceived risk implies increasing sense of control due to higher education level (Sundblad, Biel, & Gärling, 2007). In the same light, education could be associated with the probability and consequence of a disease, which could end up with lower or higher risk perception depending on the degree of misperception of risks (Sundblad et al, 2007). Therefore, strategies specifically designed for people with T2DM to counsel, motivate, and encourage them to learn about the seriousness of the complications of diabetes are highly needed. Educational programmes on risk factor control of CHD should be part of every patients' visit with the healthcare professionals, especially people with T2DM with high education and income levels.

Our study showed that people with T2DMwere likely to consume healthy diet more frequently in relation to specific perceptions (i.e., the risk subscale perceptions). They tended to consume healthy diet when they perceived that they were not too young to have a heart disease, people in their age do get heart disease, people like them do get heart disease, worrying about developing heart disease, and people who get heart disease have no chance to be cured.

Given that there was no significant associations between the items of other PRHDS subscales with health promotion behaviours, nurses in clinical practice settings should pay attention to the perceptions of people with T2DM regarding the risk subscale items as they have an important impact on their health promotion behaviours.

The study indicated positive associations of PRHDS score with duration of diagnosis with T2DM, knowledge about DM, and following a healthy diet pattern. These results are considered logical; the increased time living with diabetes would expose patients to more information about DM and its complications, enhancing their perception of risk of developing CHD. Knowledge about DM might be beneficial to people with T2DM, to link risk of developing CHD with DM. Accordingly, health education provided by nurses and other healthcare providers must discuss the seriousness of CHD for people with T2DM, the effects of CHD on health, and potential strategies to protect against CHD such as performing health promotion behaviours. Indeed, it can build the self-efficacy among people with T2DM in preventing the complications of diabetes.

Our study findings are useful for nurses and other healthcare providers in planning effective population-specific risk-reduction interventional strategies that could not only prevent development and progression of CHD among T2DM population but also promote healthy behavioural changes for CHD such as consuming healthy diet, weight control, performing regular exercise, and not smoking (Rogers, Bender, & Johnson, 2011).

Education programmes using all sources of media that include radio, television, newspaper, or magazines as well as formal and informal lessons, pamphlets, brochures, and mobile applications should be made available in places where patients with T2DM frequently assemble such as diabetes clinics, hospitals, and primary health centres. It is of note that applications that warrant interactions with participants could improve clinical outcomes and behavioural changes among patients with chronic diseases (Murray, Burns, See, Lai, & Nazareth, 2005). Such applications can positively affect behaviours related to cardiovascular diseases risk, such as physical activity and nutrition (Broekhuizen, Kroeze, van Poppel, Oenema, & Brug, 2012; Kroeze, Werkman, & Brug, 2006).

4.1 | Study limitations

This study has some limitations. The ability to infer causal relationships between variables is not possible due to the cross-sectional nature of our study. Self-reported data are susceptible to bias related to recall. Further, a convenience sampling may not be truly representative to the entire Omani diabetic population. The results of this study might not necessarily be externally valid to all people with type 1 DM as their perceptions of CHD might differ due to their insulin treatment regimen.

5 | CONCLUSION

Evidence of the perceptions of risk of developing CHD among patients with T2DM is small, and this study is first of its kind in Oman. High perception of risk of developing CHD was significantly associated with low income, low level of education, been diagnosed with T2DM for at least 5 years, and high level of knowledge about DM. Patients with T2DM who perceived CHD as having few moderate known outcomes and consequences were more likely to be consuming a healthy diet.

The high coincidence of T2DM and CHD indicates that nurses and healthcare providers should educate patients with T2DM about their high risk of developing CHD, considering all types of resources for sharing information with this population. In addition, nurses and other healthcare providers should consider implementing multiple strategies designed to counsel, motivate, and encourage people with T2DM to learn about DM and its complications.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

All authors met the authorship criteria and are in agreement with the content of the manuscript.

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