

Original Research Article

Motivational quality and competence perceptions towards healthy diet practice in patients with non-communicable diseases in Central Saudi Arabia

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ABSTRACT

Background: Saudi Arabia has faced a considerable rise of non-communicable diseases (NCD) over the past decade. Dietary changes are essential for treatment efficacy in various NCD, but local evidence indicates rather poor treatment compliance. Knowledge about the behavioral determinants of patients can help to improve intervention adherence. The self-determination theory proposes autonomy and competence perceptions towards healthy eating to play a determining role in motivation and behavioural regulation. The aim of this study was to explore diet practice, motivation, autonomy and competence perceptions in Saudi patients with NCD.

Methods: A questionnaire-based, cross-sectional study was implemented to evaluate relationships between diet habits and autonomy and competence perceptions towards healthy diet practice in patients with cardiovascular disease, diabetes and hypertension in a governmental hospital in Riyadh.

Results: 269 patients >18 years participated in the study. Self-reported diet was mediocre, characterized by low fruit and vegetable intake. Hypertensive patients showed substantially poorer diet and, at the same time, higher motivational quality compared to other patient groups ($p < 0.05$). Generally, patients demonstrated moderate motivational quality and high perceived competence, but certain sub-populations with specific commonalities strongly deviated from the norm. Competence perceptions, autonomous, as well as controlled motivation correlated with healthy diet practice ($p = 0.000$).

Conclusions: Our results indicate that both, autonomous and controlled motivation influence positive diet practice in NCD patients. We suspect a patient-group-specific exposure to health education to impact motivational quality. The influence of psychological factors on patient health behaviour is still greatly underestimated in clinical dietary interventions in KSA.

Keywords: Non-communicable disease, Healthy diet practice, Health-related behavior change, Self-determination theory, Saudi Arabia

INTRODUCTION

Over the past decade Saudi Arabia has faced a considerable rise of non-communicable diseases, with diabetes, hypertension and cardiovascular diseases substantially contributing to morbidity and premature mortality in the population.¹⁻⁴ The impact of widespread

negative health practices on the countries' NCD status, such as inactivity and poor diet habits, has been reported in various occasions.^{2,4,5} Saudi Arabia's rapid economic development has led to lifestyle and nutritional shifts-characterized by priorly motorized transport and westernization of local food culture (i.e., fast-food chains)-fostering the growth of health impairing lifestyle patterns.⁵ Lifestyle adaptations, such as dietary changes, are

crucial for treatment efficacy in various NCD.⁶⁻⁸ Many healthcare providers have yet established health education and nutritional counselling as standardized treatment protocol for some NCD.⁹⁻¹¹ However, local studies investigating patient compliance with diet protocols frequently reported rather poor adherence.¹⁰⁻¹²

Thus, many professionals in the field call for more effective health education efforts in the treatment of NCD in KSA.⁹⁻¹¹ To develop and implement high quality interventions, substantial knowledge about the particularities of behavioral determinants in specific patient populations is essential. Psychological factors such as motivation and competence perceptions play demonstrably an important role in the behavioral regulation of an individual.^{12,13} Different theories have been proposed to explain the influence of psychological factors on human behavior. One of them is the self-determination theory (SDT), a theory of human motivation and underlying behavioral regulation.¹²⁻¹⁴ The SDT takes a qualitative approach towards motivation as behavioral determinant, assuming that human motivation considerably depends on the degree of self-determination (autonomy) a person perceives. Autonomy refers to the individual's perception of control over its own actions without being forced or externally influenced.¹² Evidence has shown that higher degrees of autonomous motivation positively impact health behavior change, including diet protocol adherence in clinical populations, while more controlled forms of motivations are majorly linked to poor behavioral compliance and higher levels of dissatisfaction and anxiety.¹³⁻¹⁵ Another important component of the SDT with demonstrated positive behavior change outcomes, is a person's competence perception towards a respective behavior.^{12,18} Simply said, the more competent a person feels to effectively achieve desired outcomes, the higher the likelihood for successful and maintained behavior change.^{12,18} Scientific research efforts in KSA focusing on the particularities of chronic patients in their motivational quality and competence perceptions towards healthy diet habits do not exist yet. Hence, this study aims to make a first effort in this regard by assessing healthy diet patterns, motivational quality, perceived competence and respective associations in patients with four major NCD in KSA.

METHODS

Design

A cross-sectional design was used to determine the prevalence of healthy diet patterns, motivational quality and competence perceptions for a healthy diet in patients with one of four main NCD in a clinical setting in central Saudi Arabia.

Study population

The study population was composed by adult male and female patients (>18 years) of Arab ethnicity, visiting the outpatient department during data collection period

between May and December 2019. Inclusion criteria was the presence of one of the following as primary disease: cardiovascular disease (CVD), diabetes type 1 (DMT1), diabetes type 2 (DMT2) or hypertension (HTN). Participation in the study was voluntary.

In all, 269 patients participated in the study (females: 61%, n=137; males: 49%, n=132). In the process of data cleaning, outlier data was assessed on formal errors and authenticity. All detected outliers were considered authentic and included into the statistical data analysis.

Sampling

A probability-based, simple random stratified sampling technique based on a daily list-based sampling frame of all eligible patients registered in the endocrine and cardiology department during the data collection period, was used to generate the study sample. Sample size was estimated using the Epi-info software.²⁰ Based on a finite monthly outpatient population of 150 DM and 100 HTN and CVD patients, we estimated a minimal sample size of 109 DM and 80 HTN and CVD patients at a 95% confidence level (acceptable margin of error of 5%). A minimal daily sample size of 50% of all daily patients in each department was priorly determined.

Procedure

After random selection, the data collector approached the patients and asked for participation. All participants were given standardized explanations about study purpose, duration, anonymity and voluntary participation. From each participant, a signed informed consent was obtained prior to data collection.

Data collection

Instrument used

Data collection instrument was a paper-based bilingual questionnaire available in Arabic and English language.

Measures

Demographic and anthropometric data: The questionnaire covered gender, age groups, nationality, marital status, having children or not, educational level, occupation and two anthropometric questions for self-reported weight (kg) and height (cm). Moreover, participants had to indicate their primary diagnosis.

Diet assessment: Dietary habits were assessed with the Arabic version of the starting the conversation questionnaire (STC), a simple but efficient tool validated for dietary assessment and intervention in the clinical setting.²¹ The STC comprises eight items and measures the individuals recall on fast-food, fruit, vegetable, sugary drinks, desserts, snack and cooking fat consumption over the past few months. Responses are collected on a three-

point scale, ranging from 0 to 2. For analysis, a summary score (range 0-16) was calculated from the single item values, with lower summary scores representing a more healthful diet and higher scores representing poorer diet practice.

Motivational quality: The Arabic version of the treatment self-regulation questionnaire (TRSQ-diet version) was used to assess the participants' motivational quality towards following a healthy diet.²² The TSRQ is a 15-item scale, with three subscales: autonomous motivation (6 items), controlled motivation (6 items) and amotivation (3 items) and has previously been validated within the diet behavior domain.²³ Including all three subscales, we obtained an internal consistency coefficient (Cronbach's alpha) of .73 for the TSRQ. Since α was higher when excluding the Amotivation sub-scale ($\alpha=0.84$), most statistical analysis in this study was conducted with the autonomous and controlled motivation sub-scales only. For analysis, items of each scale were averaged and in addition, a single-value score (relative autonomy Index, RAI) was calculated according to the guidelines.²² The RAI expresses the degree of relative autonomy a person feels towards the specific behavior. Higher scores represent a higher level of autonomy and therefore better motivational quality.

Competence perceptions: We used the perceived competence scale (PCS, diet version) to measure the patients' competence perceptions towards following a healthy diet.²² The PCS is a short 4-item scale included in the in the healthcare, self-determination theory packet scale. Its reported alpha reliability is .90, while we obtained an internal consistency of $\alpha=0.98$. For analysis, item scores are summed up and averaged to attain a single-value competence score for each participant.²²

Instrument translation procedure

All instruments (demographics, STC, TRSQ, PCS) were initially available in English language. The development guidelines and adoption criteria of health survey instruments of the European commission guided the translation procedure and included both, professional forward and backward translation.²⁴

Statistical analysis

All statistical analysis was conducted using IBM SPSS statistics for Windows, version 20. Initially, data was screened on inconsistencies, writing errors, value credibility and outliers. Cronbach's alpha was calculated for the TSRQ and PCS scale to assess internal scale consistency. CFA was conducted for the TSRQ to assess its model fit. Descriptive statistics was used to present demographic data and Pearson's chi-square test was employed to assess the differences between categorical variables. One-way analysis of variance (ANOVA) was performed to assess differences between groups of

normally distributed continuous variables. If a main effect was detected, Bonferroni post-hoc procedure was used to determine significant effects within the groups. To assess the associations between interval scaled variables, bivariate correlation analysis and Pearson's correlation coefficient was computed.

RESULTS

Demographic and anthropometric participant characteristics

Demographic participant data and body mass index distribution are summarized in Table 1-3. Participants showed strong overweight on average (MBMI=28, SD=5.00), with more than a quarter falling under the obese category (Q3BMI=32). T2DM patients accounted for the largest proportion of the study population (39%, n=105), followed by CVD (33%, n=88) and HTN patients (24%, n=65). The smallest proportion comprised the T1DM patients (4%, n=11).

Table 1: Demographic characteristics of the participants.

Characteristics	N	Percentage (%)
Gender	Female	137
	Male	132
Age group (year)	18-24	3
	25-34	11
	35-44	45
	45-54	70
	55-64	82
	65+	58
Nationality*	Saudi Arabia	267
		99
Marital status	Yes	248
	No	21
Children	Yes	229
	No	40

Note: *2 participants (7%) stated Sudanese nationality.

Table 2: Participants' education level.

Education level	N	Percentage (%)
Bachelor's degree	136	51
High school diploma	71	26
Other*	26	9
Master's degree	18	7
Did not finish high school	18	7

Note: n=269. *other: 5% finished primary school (n=14), ~4% were uneducated or illiterate (n=11) and one participant was a student (0.4%).

Table 3: NCD group proportions.

Primary diagnosis	N	Percentage (%)
Diabetes type 1	11	4
Diabetes type 2	105	39
Hypertension	65	24
Cardiovascular disease	88	33

Note: N=269.

Prevalence and aspects of healthy diet practice in the patients

Mean single-value STC score was 6.9 (SD=2.84), indicating a predominance of a mediocre diet across the sample, with a slight positive tendency towards rather healthy than a poor diet practice (Figure 1 A and B). Very poor diet habits (STC score ≥ 12) were demonstrated by 7% (n=19) of the patients, with the majority (n=13) being contributed by HTN individuals. Details of the participants scoring across the eight STC sub-scales are summarized in Table 4. Generally, the patients reported a pre-dominantly low fast food, snack, sweet drinks, dessert and sweets, as well as fruit and vegetable intake. Consumption of protein was commonly high and cooking fat utilization either moderate or high.

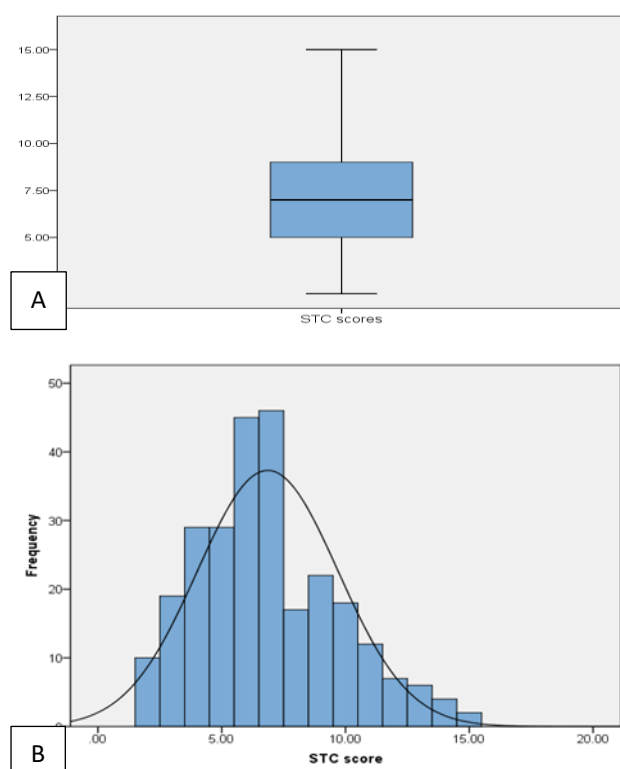


Figure 1: STC scores as measure of positive diet practices across the sample. The boxplot (A) and histogram (B) visualize the participant normal score distribution of the starting the conversation questionnaire (STC), a short tool to measure healthy diet practice. Higher scores indicate a poorer diet, while lower scores represent healthier diet habits (N=269, M=6.9, SD=2.84, Med=7, Q1=5, Q3=9).

Table 4: Descriptive statistics of self-reported food consumption over the past month.

Parameter		N	%
Fast-food and snack consumption	Less than 1x	162	61
	1-3x	81	30
	4 or more	24	9
Daily fruit intake	5 or more	21	8
	3-4	115	43
	2 or less	132	49
Daily vegetable intake	5 or more	32	12
	3-4	110	41
	2 or less	126	47
Daily consumption of sweet drinks and sodas	Less than 1	186	69
	1-2	39	15
	3 or more	43	16
Weekly protein intake (chicken, fish, beans)	More than 3x	166	62
	1-2x	95	35
	Less than 1x	7	3
Weekly consumption of snacks and crackers	1x or less	138	52
	2-3x	108	40
	4x or more	22	8
Weekly consumption of desserts and sweets	1x or less	125	47
	2-3x	72	27
	4x or more	71	26
General usage of fat, butter, oil in meal preparation	Very little	17	6
	Some	135	51
	A lot	115	43

Prevalence and aspects of healthy diet practice across the four NCD patient groups

One-way ANOVA was conducted to compare the effect of disease group association on healthy diet practice. Healthy diet patterns differed significantly between the patient groups ($F(3,262) = 11.22, p = 0.000, \eta^2 = 0.11$) (Figure 2), indicating a medium effect size with 11% explanation of variance in the healthy diet practice by the present primary disease. Bonferroni post-hoc analysis revealed the differences to be significant between HTN patients and T1DM (3.3, 95%-CI [0.96-5.6], $p = 0.001$), T2DM (2.3, 95%-CI [1.1-3.4], $p = 0.000$) and CVD (1.3, 95%-CI [0.12-2.5], $p = 0.022$) at 0.05 level of significance. T1DM, T2DM and CVD did not differ significantly from each other ($p \geq 0.05$, [Table 5]). On average HTN patients scored highest on the STC scale ($M = 8, SD = 3.60$) and approximately a quarter demonstrated poor or very poor diet habits ($Q3 = 11$). When compared to the other patient groups, HTN patients consumed the highest number of fast foods, sweet drinks/sodas, snacks/crackers, dessert/sweets and reported the highest usage of cooking fat in meal preparation. Best average STC score displayed the T1DM patients ($M = 5, SD = 2.86$), followed by the T2DM ($M = 6, SD = 2.27$) patients. The latter patient group however, showed a considerable number of outliers ($n = 8$), characterized by obesity ($MBMI = 36, SD = 3.73$).

and lower motivational quality and competence perception when compared to their disease group peers.

All outliers were screened separately and considered truthful.

Table 5: Descriptive statistics and results of one-way ANOVA and Bonferroni post-hoc analysis on differences in patient group diet practices.

Parameter		STC score			P value			
		N	M	SD	1	2	3	4
Primary diagnosis	Diabetes type 1	11	5.00	2.86	-	1.00	0.001	0.126
	Diabetes type 2	105	6.03	2.27	1.00	-	0.000	0.084
	Hypertension	65	8.29	3.60	0.001	0.000	-	0.022
	Cardiovascular disease	88	7.00	2.33	0.126	0.084	0.022	-

Note: The mean difference is significant at the 0.05 level.

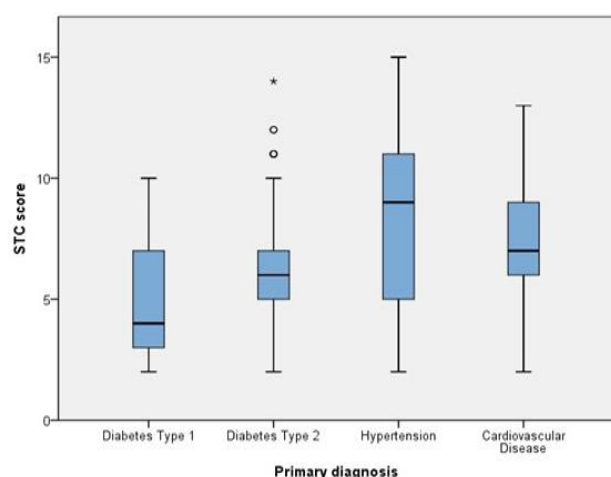


Figure 2: STC scores as measure of positive diet practices across the four NCD patient groups. N=269; T1DM: M=5, SD=2.86, T2DM: M=6, SD=2.27, HTN: M=8, SD=3.6, CVD: M=7, SD=2.33.

Behavioral regulation and relative perceived autonomy for a healthy diet across the entire sample

Mean participant RAI score was 1.8 (SD=1.36) (Figure 3 A and B), indicating a slightly stronger autonomous than controlled regulation towards healthy diet practice in the participants. When examining the three subscales of the TSRQ, results confirmed the majority of patients to score high on the autonomous motivation sub-scale (M=6, SD=0.96), moderate to high on the controlled regulation sub-scale (M=4, SD=1.29) and low on the amotivation sub-scale (M=2, SD=1.17). A considerable number of individuals scored abnormally low for autonomous motivation (n=13, [Figure 4]). The outliers were characterized by female gender (female: 61.5% vs. 38.5% males), obesity (MBMI=31, SD=5.12), advanced age (>45 years), high amotivation scores (M=4, SD=0.96), a rather low educational level and poor diet practice (M=9, SD=2.91). Similarly, the amotivation scale also showed a number of outliers (n=9) again constituted by more females (63 vs 36%), obese (MBMI=30, SD= 4.92) and rather poorly educated individuals. All outliers were screened and considered truthful.

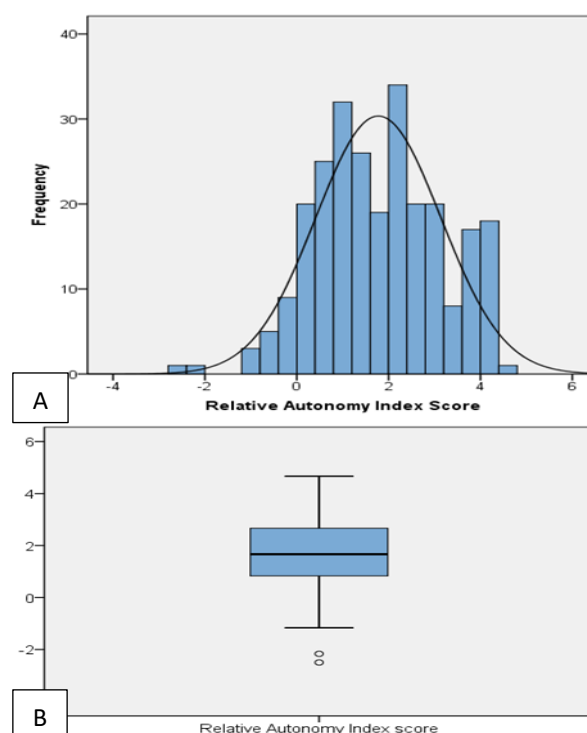


Figure 3: Histogram (A) and Boxplot (B) of RAI scores as measure of perceived relative autonomy toward a healthy diet across the sample (N=259; M=2, SD=1.36).

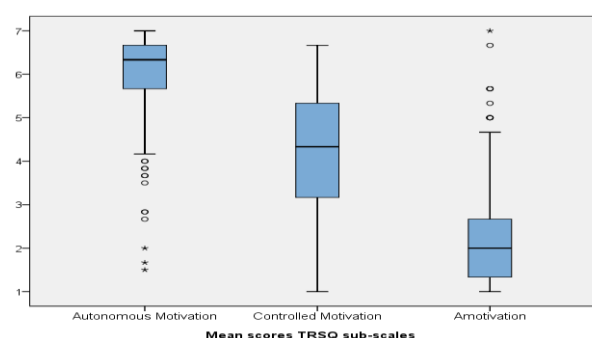


Figure 4: Score distribution of the three TSRQ sub-scales across the sample. N=258; autonomous motivation: M=6, SD=0.96; controlled motivation: M=4, SD=1.29; amotivation: M=2, SD=1.17.

Association of dietary practice and perceived relative autonomy for a healthy diet

Pearson's bivariate correlation analysis did not reveal a significant relationship between healthy diet scores (STC) and relative degree of autonomy in the sample (RAI) $r(256) = -0.002$, $p = 0.97$. The non-existence of a significant correlation persisted when controlling for primary diagnosis, age and gender $r(253) = -0.03$, $p = 0.64$. Nonetheless, a significant negative correlation was found between healthy diet score and autonomous regulation $r(257) = -0.30$, $p = 0.000$, as well as controlled regulation $r(257) = -0.21$, $p = 0.001$. For both variables, when controlled for primary diagnosis, age and gender, the significant correlation persisted $r(252) = -0.32$, $p = 0.000$; $r(252) = -0.19$, $p = 0.002$. Association of healthy diet scores and amotivation was not significant $r(256) = 0.10$, $p = 0.11$. Due to the concurrent negative correlation of the conceptually opposed sub-scales, we conducted a confirmatory factor analysis (CFA) in order to assess the model-fit in our study population. JAMOVI project version 1.2. was used to execute the CFA. The analysis revealed a poor fit of the proposed model in our population: $\chi^2(87) = 1067$, $p < 0.001$, CFI = 0.67, RMSEA = 0.20, SRMR = 0.17.

NCD patient groups differences in their perceived relative autonomy for a healthy diet

In order to evaluate if the four NCD patient groups differed based on their degree of relative autonomy towards a healthy diet, one-way ANOVA and Bonferroni post-hoc analysis were conducted. The results revealed that at 0.05 level of significance the degree of relative autonomy for a healthy diet differed significantly, but with small effect size, across the four patient groups [$F(3,258) = 3.89$, $p = 0.01$, $\eta^2 = 0.04$]. Bonferroni post-hoc analysis confirmed that HTN patients differed significantly from T2DM (0.67, 95%-CI [0.1-1.2], $p = 0.012$) and CVD patients (0.67, 95%-CI [0.08-1.27], $p = 0.018$) while no significant differences could be confirmed between the other patient groups ($p > 0.05$) (Figure 5).

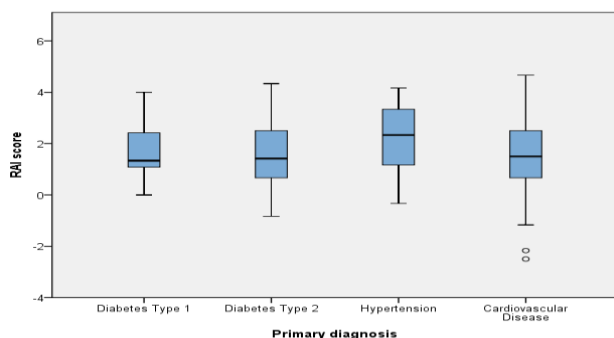


Figure 5: RAI score distribution across the four patient groups. N=269; T1DM: M=1.4, SD=1.87, T2DM: M=0.98, SD=1.85, HTN: M=1.9, SD=1.9, CVD: M=0.94, SD=1.94.

Competence perceptions for maintaining a healthy diet in across the sample

On average patients scored very high on the PCS ($M = 5$, $SD = 1.36$), with 75% ($n = 203$) demonstrating high or very high competence perceptions for a healthy diet. A proportion of 5% ($n = 15$) indicated very low competence perception ($PCS \leq 3$), majorly composed of females (80%) and obese individuals ($M = 32$, $SD = 4.5$) with poor diet habits ($M = 10$, $SD = 3.49$) and very low levels of perceived autonomy ($M = 1$, $SD = 1.53$).

Competence perceptions for maintaining a healthy diet between the four patient groups

The four patient groups did not differ significantly in their degree of competence perception towards healthy diet practice [$F(3,258) = 1.59$, $p = 0.193$].

Association of competence perception for a healthy diet with dietary practice across the sample

Pearson's correlation coefficient revealed a significant moderate correlation between PCS and STC $r(256) = -0.45$, $p = 0.000$ at 0.01 level of significance. Due to the contrasting scoring of both scales, the correlation resulted to be negative. Around 20% of the variance in participants' diet practice could be explained by their competence perception ($R^2 = 0.21$).

DISCUSSION

With this study, we aimed to shed light on diet practices in and between patients with highly common NCD in KSA and important psychological determinants of behavioral regulation. In line with local evidence on overweight in clinical populations in KSA, we also detected a critical need of body weight reduction across all patient groups. With regard to the diet pattern results, one obvious limitation of this study was the assessment of diet habits through self-reported participant recall, which is at evidenced risk of recall and social desirability bias.²⁵⁻²⁷ Hence, the results of questionnaire-based studies on diet habits should always be interpreted with care.

Local research on diet patterns in clinical populations has reported low fruit and vegetable intake and high fat consumption in diabetic and HTN patients, as well as in nationwide studies in the general population.²⁸⁻³⁰ Our results could confirm these rather poor dietary patterns across all patient groups. However, the available literature does not coincide with detected positive diet habits such as low sugar, fast food and snack consumption.²⁹⁻³¹ These findings suggest the need for dietary interventions to specifically focus on the increment of vegetable and fruit consumption and the reduction of cooking fat intake in patients with NCD in KSA. Intervention developers might also want to consider potential particularities within and between different disease groups. Our results demonstrated HTN patients to show significantly poorer

diet practice when compared to T1DM, T2DM and CVD patients. No comparative studies regarding diet habits in different NCD in KSA are available yet. Suboptimal dietary adherence has been previously reported for HTN, as well as diabetic patients, handicapping the attempt to retrieve evidence for the detected phenomenon in the available literature.^{29,30} A possible reason for the detected disease-dietary gap might be routed in the standardized disease-specific exposure to health education. As part of their treatment plan, DM patients commonly receive comprehensive health education, while these efforts are attenuated for patients with other NCD. Therefore, we firstly assume that the study outcome was impacted by the patient groups' exposure to health education and secondly, that our results indirectly confirm the positive influence potential of standardized health education on patients' dietary practice in KSA.⁹⁻¹¹

Despite such differences between NCD groups, knowledge about the particularities of vulnerable sub-populations pose another important information source to the treating clinician. We consistently detected demographic, anthropometric and psychometric commonalities of individuals strongly deviating from the population norm. Female gender, obesity, a combination of low autonomy and competence perception, amotivation as well as poor diet practice might be an indication of a high-risk patient with special needs in behavior change support.

Interesting was the outcome regarding the absence of correlation between healthy diet level and motivational quality, with concurrent significant negative correlation for both sub-scales. This phenomenon could on one hand be explained by the poor model fit detected for the latent TRSQ variables in our population. On the other hand, it supports findings from previous studies in clinical populations demonstrating more controlled forms of self-regulation, such as introjected regulation, to be linked with healthier diets in the patients.¹³ In this context, is interesting to consider that HTN patients-the group with the poorest diet practice and low exposure to health education - showed on average significantly higher motivational quality than the patient groups with more positive diet practice. Consequently, we hypothesize that health education efforts potentially influence the patients' motivation by shifting motivational regulations towards more controlled regulatory patterns, which, nonetheless lead to the desired behavioral adaptations.^{12,14} Finally, the detected link between competence perceptions and healthy diet practice suggests a valid potential of this psychometric variable to positively impact diet behavior change in chronic patients.

CONCLUSION

We conclude that a considerable proportion of behavioral regulation for a healthy diet in patients with NCD in KSA might be of controlled nature, and thus of rather low motivational quality, but not necessarily poorer diet

practice. Hypertensive patients may be at particular risk for poor diet habits, possibly due to a lack of standardized health education exposure. Standardized health education efforts should be delivered equally regardless of primary disease, with particular attention and effort to support patients with diagnosed anthropometric and psychometric risk profiles. Future studies are encouraged to investigate the disease-specific differences in health education exposure and the impact of health education on behavioral regulation in patients in NCD in KSA.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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