

Readiness to Change Physical Activity and Dietary Behaviours Among Adults with Chronic Diseases or Cardiometabolic Risk Factors in the Qassim Region, Saudi Arabia: Implications for Sustainable Primary Healthcare

Abeer Abuzeid Atta Elmannan

a.almannanali@qu.edu.sa

Department of Family & Community Medicine, College of Medicine, Qassim University

Deena Mansour Alajaji

Department of Family & Community Medicine, College of Medicine, Qassim University

Raghad Jarbou Aljarbou

Department of Family & Community Medicine, College of Medicine, Qassim University

Fatimah Saleh Alzeadi

Department of Family & Community Medicine, College of Medicine, Qassim University

Raseel Ahmad Alnjaydi

Department of Family & Community Medicine, College of Medicine, Qassim University

Fahad Abdulrahman Alfurayh

Department of Family & Community Medicine, College of Medicine, Qassim University

Research Article

Keywords: Readiness to change, Transtheoretical Model, lifestyle modification, physical activity, dietary behaviour, chronic disease, cardiometabolic risk, sustainable primary healthcare

Posted Date: September 22nd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10539403/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Regular physical activity and healthy dietary behaviours are well established in preventing chronic diseases, improving cardiometabolic risk factors, delaying disease progression, and reducing morbidity and mortality. These behaviours are particularly important for patients with chronic diseases or at high cardiometabolic risk. Lifestyle modification is a cornerstone of chronic disease management; however, many patients struggle to initiate and sustain healthy behaviours. Assessing readiness to change is therefore essential for delivering personalized, patient-centred lifestyle interventions in primary care. This study aimed to determine the proportion of primary care patients with chronic diseases or at high cardiometabolic risk who were ready to adopt healthy lifestyle behaviours and to identify factors associated with readiness.

Methods

A cross-sectional study was conducted in selected public primary care centres in the Qassim region, Saudi Arabia. A total of 402 participants with at least one diagnosed chronic disease or one or more cardiometabolic risk factors were included. Sociodemographic and clinical data were extracted from electronic health records. Readiness to change dietary and physical activity behaviours was assessed using a two-item questionnaire based on the Transtheoretical Model (TTM). Responses for both behaviours were combined to determine overall readiness. Multivariable logistic regression was used to identify independent predictors of readiness.

Results

Overall, 43% of participants were classified as ready to adopt healthy lifestyle behaviours. There were no differences in clinical variables between the ready and non-ready groups. In contrast, age and gender were significantly associated with overall readiness. Younger age and male gender were significant predictors of readiness for physical activity, whereas a higher educational level was significantly associated with greater readiness to adopt healthier dietary behaviours.

Conclusions

Less than half of primary care patients with chronic diseases or at high cardiometabolic risk were ready to adopt healthy lifestyle behaviours, and readiness was influenced more by sociodemographic factors than by clinical status. These findings highlight the importance of routinely assessing readiness to change and delivering personalized, stage-matched lifestyle interventions rather than adopting a one-size-fits-all approach. Routine assessment using brief TTM-based tools can help clinicians tailor

counselling, integrate physical activity and dietary advice into primary care, and address barriers—making lifestyle recommendations more practical and sustainable for patients and providers.

Background

Non-communicable diseases (NCDs) represent one of the greatest global public health challenges, accounting for the majority of deaths, disability, and healthcare burden worldwide [1]. In Saudi Arabia, the burden of NCDs continues to rise, driven by increasing obesity, physical inactivity, unhealthy dietary habits, and other cardiometabolic risk factors [2].

Lifestyle modification is a cornerstone of the prevention and management of non-communicable diseases. physical activity and healthy dietary behaviours have been shown to prevent disease onset, improve cardiometabolic risk factors, delay disease progression, and reduce morbidity and mortality [3–8].

Recently, the American College of Lifestyle Medicine published new clinical practice guidelines aimed at assisting clinicians in the management of patients with prediabetes and type 2 diabetes [9]. These guidelines focus primarily on the six pillars of lifestyle medicine, including whole-food, plant-predominant nutrition, physical activity, restorative sleep, stress management, social connectedness, and avoidance of risky substances, placing them at the forefront as the central approach and key interventions for treatment. The guidelines are intended to complement, rather than replace, other treatment guidelines. At the same time, these guidelines are not only useful for the management of prediabetes and type 2 diabetes but are also critical for other chronic diseases in which lifestyle modifications are recommended. In light of these recommendations, it has become of paramount importance to assess baseline lifestyle behaviours and readiness to change before prescribing interventions, ensuring that they are actionable and sustainable [10].

Despite the proven effectiveness of lifestyle interventions [11, 12], many patients struggle to initiate and maintain healthy behaviours [13–15]. Behaviour change is a complex process influenced by multiple psychological, social, and environmental factors, and patients differ considerably in their willingness and preparedness to change. Consequently, assessing an individual's readiness to change has become an important component of patient-centred lifestyle counselling, enabling healthcare professionals to tailor interventions according to each patient's level of motivation and preparedness.

The Transtheoretical Model (TTM), also known as the Stages of Change Model, is one of the most widely used theoretical frameworks for understanding health behaviour change [16]. The model conceptualizes behaviour change as a dynamic and progressive process comprising five stages: precontemplation, contemplation, preparation, action, and maintenance. Individuals move from having no intention to change, to considering and preparing for change, initiating new behaviours, and ultimately sustaining them over time. By identifying a patient's stage of change, healthcare professionals can deliver stage-matched interventions that are more likely to facilitate successful and sustained behaviour change than a one-size-fits-all approach.

Although the Transtheoretical Model has been widely applied to assess readiness for lifestyle behaviour change in diverse populations, evidence from primary care settings in Saudi Arabia remains limited, particularly among adults with chronic diseases or cardiometabolic risk factors. As a result, little is known about patients' readiness to adopt healthier dietary and physical activity behaviours or the factors that influence their willingness to change. Addressing this knowledge gap is essential for designing stage-matched, personalized lifestyle interventions that can be effectively integrated into routine primary care and contribute to improved chronic disease prevention and management.

This study aimed to determine the distribution of adults with chronic diseases or cardiometabolic risk factors across the stages of change for physical activity and dietary behaviours using the Transtheoretical Model (TTM), and to identify predictors of readiness to adopt healthier lifestyle behaviours. The findings of this study provide valuable evidence to support the integration of readiness assessment into routine primary care, enabling personalized, stage-matched lifestyle counselling to strengthen chronic disease management and promote sustainable primary healthcare.

Methods

This was a cross-sectional study conducted in selected public primary care centers located in Buraidah, the largest city in Qassim. These centers provide routine services to individuals with chronic diseases as well as those identified as being at high risk for cardiometabolic conditions. The selected centers serve a diverse patient population and offer a range of services, including routine health assessments, chronic disease management, and preventive care interventions.

The sample size was calculated using Epitools based on the formula for estimating a single proportion. The calculation aimed to determine the required sample to estimate the prevalence of readiness for lifestyle change with sufficient precision. An estimated true proportion of 0.5 was used to allow for maximum variability, with a desired precision of 0.05 and a 95% confidence level. The final estimated total sample size was 402 participants.

A consecutive sampling technique was used to recruit participants attending the selected primary care centers. To enhance representativeness, Buraidah was stratified into five geographical zones (north, south, east, west, and central). One major public primary care center was selected from each zone based on patient volume to ensure adequate and diverse patient attendance.

From each selected center, participants were recruited consecutively until the required sample size was reached. The total sample was divided equally across the five centers, with a target of at least 80 participants per center.

Eligible participants were adults aged 18 years or older who attended one of the selected primary healthcare centers during the study period. Participants were required to have at least one diagnosed chronic condition, such as hypertension, diabetes mellitus, or dyslipidemia, or to be identified as being at high cardiometabolic risk, including obesity, elevated blood pressure, elevated blood glucose, or current

smoking. Individuals were excluded if they had an acute illness at the time of data collection, were pregnant because of the temporary physiological changes associated with pregnancy, or had cognitive, mental, or psychiatric conditions that impaired their ability to participate in the study or provide informed consent.

Data collection was conducted using a structured questionnaire comprising two parts (Supplementary File 1). Part 1 was developed by the research team to collect participants' sociodemographic characteristics and clinical information. Clinical data were extracted from the electronic health records using a structured data collection form and included diagnosed chronic conditions, anthropometric measurements (e.g., body mass index [BMI] and waist circumference), blood pressure, and available laboratory parameters, including lipid profile, fasting blood glucose, and glycated hemoglobin (HbA1c). Part 2 consisted of two questions adapted from the Diabetes Training and Technical Assistance Center (DTTAC) Readiness Assessment [17], which is based on Prochaska's Transtheoretical Model (TTM) and was developed for use in the National Diabetes Prevention Program [16]. The questionnaire assessed participants' stage of readiness to change two modifiable lifestyle behaviours—dietary habits and physical activity—according to the five stages of behaviour change: precontemplation, contemplation, preparation, action, maintenance, and relapse. Healthy dietary behaviour was defined as consuming smaller portion sizes, choosing low-fat food options, and increasing the daily intake of fruits and vegetables. Physical activity was defined as engaging in activities such as walking, cycling, or sports for at least 20 minutes per session, three to five times per week. This two-part approach enabled comprehensive data collection while minimizing participant burden. Before data collection, all data collectors were familiarized with the study procedures and data collection tools to ensure consistency in data collection.

Participants' responses for both behaviors were used to determine their overall readiness for lifestyle change. For each behavior, participants in the preparation, action, or maintenance stages were classified as "ready to change," whereas those in the precontemplation or contemplation stages were classified as "not ready to change." A composite readiness variable was then created, whereby participants were categorized as "ready" only if they were classified as ready to change for both lifestyle behaviors. Participants who were not ready to change in one or both behaviors were classified as "not ready."

Data were entered into a secure electronic database accessible only to the research team and were kept strictly confidential. The primary outcome of the study was the level of readiness for lifestyle change in relation to physical activity and dietary habits. The study also aimed to identify predictors of low readiness among participants.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participants' sociodemographic, clinical, and metabolic characteristics. To assess differences in readiness levels across subgroups such as risk status, gender, and other relevant variables, chi-square tests and independent-sample t-tests were applied where appropriate. Furthermore, multivariable logistic regression analysis was conducted to identify independent predictors of readiness

to change. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 32.0. A two-sided $P < 0.05$ was considered statistically significant.

Ethical approval

was obtained from the Qassim Regional Institutional Review Board (IRB) prior to implementation. Informed consent was obtained from all participants before data collection. Participation was entirely voluntary, and participants had the right to withdraw at any time without any consequences to their care. To ensure confidentiality, all data were anonymized and securely stored.

Results

A total of 402 participants were included in this study, with 43% comprising the group ready to adopt a healthy lifestyle (Table 1). Overall, the majority of participants were in the age group 44–59 years. Female participants accounted for over 72%. The vast majority of participants were non-smokers. However, over 79% were either overweight or obese.

Most participants displayed good glycemic control (52.5%), normal triglyceride levels (85.8%), and normal total cholesterol (62.9%). However, despite the high rate of normal total cholesterol, LDL was abnormally elevated in over half of the participants.

There were no differences in clinical variables between the ready and non-ready groups. However, statistically significant differences were observed in age, gender, educational level, and smoking status. A significant decline in readiness was observed with increasing age ($p = 0.009$). Younger participants were more likely to be classified as ready for adopting health lifestyle behavior compared with older age groups. Readiness dropped from 53.0% among participants aged 18–39 years to 44.6% among those aged 40–59 years and 30.9% among participants aged ≥ 60 years. Males demonstrated a higher level of readiness compared with females (59.6% vs. 36.9%, $p \leq 0.001$). However, a progressive rise in readiness was observed across educational levels. Participants with higher levels of education demonstrated greater readiness (52.4%), compared to those with lower levels of education ($p < 0.001$). Former or current smokers showed higher levels of readiness in this study compared to non-smokers (60% vs 41.2%, $p = 0.022$)

Table No. (1): Sociodemographic & Clinical Profile of High-Risk and Chronic Disease Patients in Buraidah Primary Health Centers, Qassim 2025 (N = 402)

Variable n(%)	All N = 402	Ready to adopt a healthy lifestyle. N = 173	Not Ready N = 229	Chi- squared P.value
Age groups *				0.009
18–39	83 (20.6%)	44(53%)	39(47%)	
40–59	222 (55.2%)	99(44.6%)	123(55.4%)	
≥ 60	97 (24.1%)	30 (30.9%)	67(69.1%)	
Gender*				0.001
Male	109 (27.1%)	65(59.6%)	44(40.4%)	
Female	293 (72.9%)	108(36.9%)	185 (63.1%)	
Educational Level*				0.001
low	120(29.9%)	34 (28.3%)	86 (71.7%)	
Secondary	139(34.6%)	64 (46%)	75 (54%)	
high	143(35.6%)	75 (52.4%)	68 (47.6%)	
Smoking Status*				0.022
Non-smoker	362(90%)	149 (41.2%)	213 (58.8%)	
Former or current	40(10%)	24 (60%)	16 (40%)	
BMI				0.340
Normal ($\leq 25\text{kg/m}^2$)	84(20%)	40(47.6%)	44(52.4%)	
Overweight or obese ($\geq 25\text{kg/m}^2$)	318(79.1%)	133 (41.8%)	185 (58.2%)	
HBA1C				0.211
Normal ($\leq 5.7\%$)	211(52.5%)	97(46%)	114(54%)	
Elevated ($\geq 5.7\%$)	191 (47.5%)	76(39.8%)	115 (60.2%)	
Triglycerides				0.465
Normal ($\leq 150\text{ mg/dL}$)	345(85.8%)	151(43.8%)	194(56.2%)	
Elevated ($\geq 150\text{mg/dL}$)	57(14.2%)	22(38.6%)	35(61.4%)	

Variable n(%)	All N = 402	Ready to adopt a healthy lifestyle. N = 173	Not Ready N = 229	Chi- squared P.value
LDL				0.494
Normal (< 115 mg/dL)	185(46%)	83(44.9%)	102(55.1%)	
Elevated (≥ 115 mg/dL)	217(54%)	90(41.5%)	127(58.5%)	
Total Cholesterol				0.137
Normal (< 200 mg/dL)	253(62.9%)	116 (45.8%)	137 (54.2%)	
Elevated (≥ 200 mg/dL)	149(37.1%)	57 (38.3%)	92 (61.7%)	

The level of readiness to adopt healthy lifestyle behaviors was comparable between the two target behaviors (Table 2). Approximately one-third of participants (36% and 35%) were in the action or maintenance stages for physical activity and dietary behaviors, respectively.

When combining the two behaviors, approximately 31% of participants were in the action and/or maintenance stages for both. Based on the composite variable, including preparation, action, and maintenance stages combined, only 43% of participants were considered ready to adopt healthy lifestyle changes.

Table No. (2): Readiness Levels for Lifestyle Change Among the Study Participants. (N = 402)

Stage of Change (According to Transtheoretical model)	Dietary Behavior	Physical Activity Behavior	Both Behaviors*
Maintenance (%)	20.6%	17.4%	10.2%
Action (%)	14.4%	19.7%	19.7%
Preparation (%)	26.6%	17.2%	43%
Contemplation (%)	25.6%	33.6%	82.3%
Pre-contemplation (%)	12.7%	12.2%	100%
Total	100%	100%	

In the crude analysis, age and gender were significantly associated with lower odds of readiness to adopt healthy lifestyle (Table 3). These associations remained significant after adjustment for other variables. Individuals over 60 years of age had 56.8% lower odds of readiness to adopt healthy lifestyle compared to younger age groups (AOR = 0.432, 95% CI: 0.206–0.909, p = 0.027). while females had 63.4% lower odds compared to males (AOR = 0.366, 95% CI: 0.204–0.657, p = 0.003). Although higher educational levels and smoking were initially significantly associated with increased odds of readiness

for adopting healthy lifestyle behavior, these associations were attenuated after adjustment for other variables in the multivariable model. Other clinical parameters were not statistically significant.

Table No. (3): Unadjusted and Adjusted Odds Ratios (ORs) for Overall Readiness (Dietary and Physical activity) and Its Predictors: Multivariable Logistic Regression Analysis (N = 402).

Variable	UOR (95% CI)	p-value	AOR (95% CI)	p-value
Age				
40–59	0.713(0.430–1.183)	0.191	0.8570.4881.504	0.591
≥ 60	0.397 (0.216–0.730)	0.003	0.4320.2060.909	0.027
Gender	0.395 (0.252–0.620)	0.001	0.3660.2040.657	0.003
Educational Level				
Secondary	2.158 (1.285–3.625)	0.004	1.4600.8302.568	0.189
high	2.790 (1.667–4.670)	0.001	1.6070.8732.959	0.127
Smoking Status	2.144 (1.101–4.175)	0.025	1.2140.5462.700	0.634
BMI	0.791 (0.488–1.281)	0.341	1.0070.5971.697	0.980
HBA1C	0.777(0.522–1.155)	0.212	0.9200.5831.450	0.719
Triglycerides	0.808 (0.455–1.434)	0.466	0.6770.3541.295	0.238
LDL	0.871 (0.586–1.294)	0.494	0.9950.6161.605	0.983
Total Cholesterol	0.732(0.484–1.106)	0.138	0.7180.4381.179	0.190

When examined separately, readiness for specific healthy lifestyle behaviors showed variability (Table 4). While age and gender continued to demonstrate a significant association with readiness for adopting healthy physical activity behaviour, this association was no longer observed for dietary behavior. On the other hand, no association was found between educational level and overall readiness in the adjusted model (Table 3). However, when analyzed individually, higher educational levels were significantly associated with greater readiness for adopting healthy dietary behavior, with increased odds observed in the multivariable model (AOR = 1.861,95% CI: 1.010–3.427, p = 0.046).

Table No. (4): Odds of readiness for specific healthy lifestyle behaviors based on demographic and clinical factors among participants (N = 402)

OR (95% CI)		
Variable	Dietary Behaviour	Physical Activity Behaviour
Age		
40–59	0.763 (0.420–1.384)	0.871 (0.486–1.561)
≥ 60	0.607 (0.289–1.275)	0.432 (0.204–0.912)
Gender	0.564 (0.307–1.036)	0.339 (0.183–0.629)
Educational Level		
Secondary	1.356 (0.785–2.340)	1.613 (0.929–2.801)
high	1.861 (1.010–3.427)	1.541 (0.841–2.825)
Smoking Status	1.710 (0.693–4.219)	1.238 (0.519–2.954)
BMI	1.422 (0.840–2.407)	1.013 (0.595–1.724)
HBA1C	1.0840.6901.704	0.772 (0.491–1.215)
Triglycerides	0.7250.3881.353	0.966 (0.511–1.828)
LDL	1.0900.6721.766	0.888 (0.549–1.436)
Total Cholesterol	0.7260.4431.190	0.618 (0.378–1.013)

Bold values are significant (P < 0.05).

Discussion

The present study included individuals with established chronic diseases as well as those possessing at least one risk factor for chronic disease, representing a population that stands to benefit substantially from lifestyle modification. The high prevalence of modifiable cardiometabolic risk factors observed among the study participants, including obesity, elevated low-density lipoprotein (LDL) cholesterol, and poor glycaemic control, is consistent with previous reports demonstrating the considerable burden of these risk factors among adults with or at risk of chronic diseases [18, 19]. Although the coexistence of these risk factors places individuals at increased risk of disease progression, complications, and adverse clinical outcomes if left inadequately managed, it also presents an important opportunity for preventive intervention. Lifestyle interventions are a cornerstone of chronic disease prevention and management, with improvements in dietary behaviours, physical activity, and weight management shown to improve metabolic health, reduce disease-related complications, and enhance long-term health outcomes. However, the effectiveness of such interventions depends not only on their availability but also on individuals' readiness to adopt and sustain healthier lifestyle behaviours.

Against this background, the present study assessed readiness to change for two key lifestyle behaviours—nutrition and physical activity—and found that 43% of participants were classified as ready to change, defined as being in the Preparation, Action, or Maintenance stages for both behaviours simultaneously. To our knowledge, this is the first study to systematically assess readiness to change among individuals with chronic diseases or at high risk for chronic diseases in Saudi Arabia, based on data from one of the country's larger provinces.

Previous studies have examined readiness to adopt healthier dietary behaviours and engage in physical activity among different study populations, with reported levels of readiness varying considerably [18, 20, 21]. However, direct comparison with the present study is challenging because most previous studies assessed readiness for individual lifestyle behaviours rather than combined readiness across multiple behaviours. Furthermore, the criteria used to define readiness and the study populations also differed across studies. Despite these methodological differences, the available evidence consistently suggests that readiness to change is behaviour-specific, emphasizing the importance of assessing each lifestyle behaviour individually to inform personalized lifestyle interventions [22, 23]. It should also be acknowledged that readiness to change is commonly assessed using self-reported measures, which may overestimate individuals' actual readiness to adopt healthier behaviours. Moreover, behaviour change is a dynamic process, and progression through the stages is not always linear, with relapse or regression to earlier stages being common.

Readiness to change and self-efficacy are closely related but distinct constructs. While readiness reflects an individual's motivation to change, self-efficacy refers to confidence in one's ability to initiate and sustain the desired behaviour. Previous research has shown that individuals may be motivated to change despite having limited confidence in their ability to succeed. For example, a study among smokers found that although participants were motivated to quit smoking, many reported low confidence in their ability to quit successfully [24]. These findings suggest that assessing patients' confidence alongside their readiness may provide a more comprehensive understanding of their capacity to initiate and sustain lifestyle changes. Previous studies have similarly incorporated self-efficacy assessments to evaluate patients' confidence in adopting healthy lifestyle behaviours, supporting the value of assessing both readiness and confidence in clinical practice [10, 25]. Accordingly, integrating assessment of both readiness to change and self-efficacy into routine primary care may facilitate the delivery of more personalized and effective lifestyle interventions.

An additional challenge in implementing stage-based lifestyle counselling is the accurate assessment of patients' readiness to change. Without adequate training or the use of standardized assessment tools, clinicians may find it difficult to correctly identify an individual's stage of readiness and, consequently, to match behaviour change strategies to the patient's needs. This concern is supported by a previous study demonstrating that general practitioners had limited accuracy in assessing patients' stages of change [26]. These findings underscore the importance of equipping healthcare professionals with appropriate training and incorporating validated readiness assessment tools into routine primary care. Such an

approach may facilitate the delivery of timely, stage-tailored, and personalized lifestyle interventions, ensuring that the right support is provided to the right patient at the right time.

Beyond the overall level of readiness, the present study identified younger age and male gender as significant independent predictors of overall readiness to adopt healthier lifestyle behaviours. This finding is broadly consistent with previous studies that have identified age and gender as important determinants of readiness to change. For example, age and gender have been reported as predictors of the pre-contemplation stage, while gender has also been identified as a predictor of the termination stage for physical activity [27]. Another study similarly found that males and females differed in their stages of change for physical activity, although no gender differences were observed for dietary fat intake [28]. However, findings have not been entirely consistent. For instance, one study reported that readiness for physical activity was not significantly predicted by either age or gender [29]. The higher readiness to change observed among younger participants in the present study may have several explanations. Younger adults may place greater emphasis on physical appearance, body image, and maintaining fitness, which could increase their motivation to adopt healthier lifestyle behaviours. In addition, gyms and fitness centers have become increasingly popular among younger generations, serving not only as places for exercise but also as social settings that encourage participation in physical activity. Similarly, the growing availability of healthier meal options with calorie labelling may facilitate healthier dietary choices. Given that all participants in the present study had one or more chronic diseases or comorbidities, or were at high risk for chronic diseases, awareness of their health status may have further enhanced their willingness to adopt healthier lifestyle behaviours to improve their overall health and quality of life. However, these factors should be interpreted alongside the increasing prevalence of sedentary lifestyles among younger generations, driven by greater reliance on technology, prolonged screen time, and reduced outdoor activities. Therefore, the greater readiness observed among younger participants may reflect a higher motivation to adopt healthier behaviours despite continued exposure to lifestyle factors that promote physical inactivity and unhealthy eating practices.

The greater readiness observed among male participants may also have several possible explanations. Differences in access to fitness facilities and their affordability may influence individuals' willingness to engage in regular physical activity. In addition, job-related factors, daily routines, and family and childcare responsibilities may affect the time available to participate in regular physical activity and maintain healthy lifestyle behaviours. Cultural and social practices may also play a role, as family gatherings and social occasions often involve the consumption of sweets and energy-dense foods, making dietary modification more challenging. It is also noteworthy that, although the study sample was predominantly female, only 26.9% of female participants were classified as ready to change. Interestingly, both younger age and male gender remained significant predictors of readiness for physical activity but were not associated with readiness for dietary behaviour when each behaviour was analysed separately. Collectively, these findings suggest that the observed associations with age and gender were primarily driven by differences in readiness for physical activity rather than dietary behaviour.

When dietary behaviour was analyzed separately, higher educational level emerged as a significant predictor of readiness to change. This finding is both biologically and behaviourally plausible, as education may enhance health literacy, improve understanding of nutritional recommendations and the health risks associated with unhealthy eating patterns, and empower individuals to make informed dietary choices. Compared with physical activity, adopting healthier dietary behaviours may be more complex, requiring knowledge of nutritional principles, meal planning, portion control, and food selection. Consequently, limited nutrition knowledge may represent an important barrier to dietary behaviour change, highlighting the importance of providing nutrition education tailored to individuals with lower educational levels. Although educational level was not associated with readiness for physical activity in the present study, previous research has demonstrated that higher educational attainment was associated with lower resistance to increasing habitual physical activity [30]. Together, these findings support the broader role of education in facilitating readiness for healthy lifestyle behaviour change, although its influence may vary across different behaviours and populations.

Interestingly, none of the cardiometabolic risk factors examined in this study, including body mass index (BMI), low-density lipoprotein (LDL) cholesterol, glycated haemoglobin (HbA1c), and triglyceride levels, were significantly associated with readiness to change lifestyle behaviours. This finding differs from previous studies that reported significant associations between readiness to change and cardiometabolic indicators. For example, overweight or obese individuals and those with hypercholesterolaemia were found to have greater readiness to increase physical activity and reduce dietary fat intake among patients with ischaemic heart disease [18]. Similarly, studies among individuals with type 2 diabetes reported that higher BMI was associated with greater resistance to adopting healthy dietary and physical activity behaviours, while healthier nutrition behaviours were associated with better glycaemic control and physical activity behaviours with cholesterol levels [30, 31]. Nevertheless, our findings suggest that the presence or severity of cardiometabolic risk factors alone may not be sufficient to motivate individuals to adopt healthier lifestyle behaviours. Several factors may explain this. Participants may have had limited awareness of the relationship between these risk factors and the benefits of lifestyle modification for improving health outcomes. In addition, reliance on pharmacological therapy may inadvertently diminish the perceived importance of lifestyle change if patients believe that medications alone are sufficient to control their condition. Patients may also perceive adherence to medication regimens as easier than maintaining long-term dietary and physical activity changes or have limited confidence in the ability of lifestyle interventions to improve cardiometabolic health and disease outcomes. These findings highlight the importance of integrating structured lifestyle counselling and behaviour change support into routine clinical care to improve patients' understanding of the therapeutic value of healthy lifestyle behaviours and enhance their readiness to engage in sustainable behaviour change alongside pharmacological treatment.

Strengths and Limitations of the Study

To our knowledge, this is the first study to assess readiness to change nutrition and physical activity behaviours among adults with chronic diseases or cardiometabolic risk factors attending primary care in Saudi Arabia. As such, it provides novel evidence to support the integration of personalized lifestyle counselling into routine primary care.

This study has several limitations. First, its cross-sectional design provides important baseline information on the prevalence of readiness to change but does not permit causal inferences or assessment of changes in readiness over time. Longitudinal and interventional studies are needed to evaluate how readiness evolves and whether stage-tailored lifestyle interventions can effectively promote sustained behaviour change. Second, the study included two related but distinct participant groups—individuals with established chronic diseases and those with cardiometabolic risk factors. Although these groups share many characteristics, living with a diagnosed chronic disease may influence readiness differently from having risk factors alone. Future studies should examine these groups separately to better understand differences in readiness and intervention needs.

Conclusions

Readiness to change was influenced more by sociodemographic factors than by clinical status, and it was behaviour-specific, differing between physical activity and diet. Clinicians should therefore assess a patient's readiness and baseline behaviour before prescribing lifestyle interventions, allowing counselling to be tailored appropriately rather than delivered as a one-size-fits-all approach. Routine assessment using brief, validated tools based on the Transtheoretical Model can help clinicians deliver personalized, stage-matched interventions, integrate physical activity and dietary advice into routine primary care, and address barriers that hinder behaviour change. Incorporating readiness assessment within lifestyle-change frameworks would make recommendations more practical, patient-centred, and sustainable for both patients and providers.

Abbreviations

AOR
Adjusted odds ratio
BMI
Body mass index
CI
Confidence interval
HbA1c
Glycated hemoglobin
IRB
Institutional Review Board
LDL
Low-density lipoprotein

NCBE
National Committee of Bio and Medical Ethics
NCDs
Non-communicable diseases
OR
Odds ratio
TTM
Transtheoretical Model

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Regional Research Ethics Committee, Qassim Province (approval number 607-46-014742). The study was conducted in accordance with the principles of the Declaration of Helsinki and in compliance with the regulations set by the National Committee of Bio and Medical Ethics (NCBE), Saudi Arabia. Written, and when not possible only verbal, informed consent was obtained from all participants prior to their inclusion in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author Contribution

A.A. conceived and designed the study, supervised all stages of the research, and contributed to the analysis and interpretation of the data. D.A. contributed to data collection, data entry, descriptive statistical analysis, and drafting of the original manuscript. R.A. and R.J. contributed to data collection, data entry, and drafting of the original manuscript. F.S.A. contributed to data collection and drafting of the original manuscript. F.A.A. contributed to data collection and data entry. All authors reviewed the manuscript and approved the final version for submission.

Acknowledgement

The Researchers would like to thank the Deanship of Graduate Studies and Scientific Research at Qassim University (<https://www.qu.edu.sa>) for financial support (QU-APC-2026). We extend our sincere appreciation to all patients who gave their time to participate in this study. We also thank the physicians,

nurses, and administrative staff of the participating primary healthcare centres in Buraidah, Qassim, whose support and cooperation were instrumental throughout participant recruitment and data collection.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to institutional and ethical restrictions, but are available from the corresponding author on reasonable request. The study questionnaire and data collection form are available from the corresponding author on request.

References

1. Li J, Pandian V, Davidson PM, Song Y, Chen N, Fong DYT. Burden and attributable risk factors of non-communicable diseases and subtypes in 204 countries and territories, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021. *Int J Surg*. 2025;111(3):2385–97. <https://doi.org/10.1097/JS9.0000000000002260>.
2. Public Health Authority (Saudi Arabia). Noncommunicable diseases in Saudi Arabia. Riyadh: Public Health Authority. 2019. <https://www.pha.gov.sa/en-us/OpenData/OpenData/NCD%20Book-Final%20Version.pdf>. Accessed [day month year].
3. Zhao W, Yan Q, Mou C. Physical activity and cardiovascular-metabolic disease risk across cardiovascular-kidney-metabolic syndrome stages: a population-based cohort study. *BMC Cardiovasc Disord*. 2025;25:748. <https://doi.org/10.1186/s12872-025-05216-3>.
4. Aryannezhad S, Imamura F, Mok A, Wareham NJ, Forouhi NG, Brage S. Combined associations of physical activity, diet quality and their trajectories with incidence of diabetes and cardiovascular diseases in the EPIC-Norfolk Study. *Sci Rep*. 2025;15:11261. <https://doi.org/10.1038/s41598-025-93679-x>.
5. Van Buskirk J, Partridge S, Clare P, Giovannucci E, Bauman A, Benjamin EJ, et al. Conjoint associations of adherence to physical activity and dietary guidelines with cardiometabolic health: the Framingham Heart Study. *J Am Heart Assoc*. 2021;10:e019800. <https://doi.org/10.1161/JAHA.120.019800>.
6. Anderson E, Durstine JL. Physical activity, exercise, and chronic diseases: a brief review. *Sports Med Health Sci*. 2019;1(1):3–10. <https://doi.org/10.1016/j.smhs.2019.08.006>.
7. Chapman CG, Schroeder MC, Marcussen B, Carr LJ. Identifying patients at risk for cardiometabolic and chronic diseases by using the Exercise Vital Sign to screen for physical inactivity. *Prev Chronic Dis*. 2025;22:E02. <https://doi.org/10.5888/pcd22.240149>.
8. Wang W, Zhou H, Qi S, Yang H, Hong X. The association between physical activities combined with dietary habits and cardiovascular risk factors. *Heliyon*. 2024;10(7):e28845. <https://doi.org/10.1016/j.heliyon.2024.e28845>.

9. Rosenfeld RM, Grega ML, Karlsen MC, Abu Dabrh AM, Aurora RN, Bonnet JP, et al. Lifestyle interventions for treatment and remission of type 2 diabetes and prediabetes in adults: a clinical practice guideline from the American College of Lifestyle Medicine. *Am J Lifestyle Med.* 2025;19(2 Suppl):S10–131. <https://doi.org/10.1177/15598276251325488>.
10. Okube OT, Kimani ST. Effectiveness of Trans-Theoretical Model-based health education intervention in the promotion of lifestyle changes among adults with metabolic syndrome: a randomized controlled trial. *SAGE Open Nurs.* 2024;10:23779608241251658. <https://doi.org/10.1177/23779608241251658>.
11. Ding D, Van Buskirk J, Partridge S, Clare P, Giovannucci E, Bauman A, et al. The association of diet quality and physical activity with cardiovascular disease and mortality in 85,545 older Australians: a longitudinal study. *J Sport Health Sci.* 2024;13(6):841–50. <https://doi.org/10.1016/j.jshs.2024.05.011>.
12. Andersen E, van der Ploeg HP, van Mechelen W, Gray CM, Mutrie N, van Nassau F, et al. Contributions of changes in physical activity, sedentary time, diet and body weight to changes in cardiometabolic risk. *Int J Behav Nutr Phys Act.* 2021;18:166. <https://doi.org/10.1186/s12966-021-01237-1>.
13. Deslippe AL, Soanes A, Bouchaud CC, Beckenstein H, Slim M, Plourde H, et al. Barriers and facilitators to diet, physical activity and lifestyle behavior intervention adherence: a qualitative systematic review of the literature. *Int J Behav Nutr Phys Act.* 2023;20:14. <https://doi.org/10.1186/s12966-023-01424-2>.
14. Cavallo M, Morgana G, Dozzani I, Gatti A, Vandoni M, Pippi R, et al. Unraveling barriers to a healthy lifestyle: understanding barriers to diet and physical activity in patients with chronic non-communicable diseases. *Nutrients.* 2023;15(15):3473. <https://doi.org/10.3390/nu15153473>.
15. Subramaniam M, Devi F, AshaRani PV, Zhang Y, Wang P, Jeyagurunathan A, et al. Barriers and facilitators for adopting a healthy lifestyle in a multi-ethnic population: a qualitative study. *PLoS ONE.* 2022;17(11):e0277106. <https://doi.org/10.1371/journal.pone.0277106>.
16. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot.* 1997;12(1):38–48. <https://doi.org/10.4278/0890-1171-12.1.38>.
17. Diabetes Training and Technical Assistance Center (DTTAC). Readiness to Change Questionnaire. National Diabetes Prevention Program. 2018. https://coveragetoolkit.org/wp-content/uploads/2023/04/Updated-Readiness-Assessment-2018_DTTAC.pdf
18. Eshah NF. Readiness for behavior change in patients living with ischemic heart disease. *J Nurs Res.* 2019;27(6):e57. <https://doi.org/10.1097/JNR.0000000000000336>.
19. Prugger C, Wellmann J, Heidrich J, De Bacquer D, De Backer G, Périer MC, et al. Readiness for smoking cessation in coronary heart disease patients across Europe: results from the EUROASPIRE III survey. *Eur J Prev Cardiol.* 2015;22(9):1212–9. <https://doi.org/10.1177/2047487314564728>.
20. Stettaford T, Fehily C, Campbell E, Barker D, Oldmeadow C, McKeon E, et al. Risk prevalence, readiness and confidence to change lifestyle risk factors among clients of community mental health services. *Aust N Z J Psychiatry.* 2024;58(8):702–12. <https://doi.org/10.1177/00048674241257751>.

21. McGavock J, Durksen A, Wicklow B, Malik S, Sellers EA, Blydt-Hansen T, et al. Determinants of readiness for adopting healthy lifestyle behaviors among Indigenous adolescents with type 2 diabetes in Manitoba, Canada: a cross-sectional study. *Obes (Silver Spring)*. 2018;26(5):910–5. <https://doi.org/10.1002/oby.22148>.
22. Elsayhori NA, Subih HS, Hammouh F, Hammad FJ. Stage of change of Transtheoretical Model for nine health-related behaviors among hypertensive patients: cross-sectional study. *Patient Prefer Adherence*. 2024;18:1691–711. <https://doi.org/10.2147/PPA.S442291>.
23. Taylor WC, Hepworth JT, Lees E, Cassells A, Gousse Y, Sweeney MM, et al. Readiness to change physical activity and dietary practices and willingness to consult healthcare providers. *Health Res Policy Syst*. 2004;2:2. <https://doi.org/10.1186/1478-4505-2-2>.
24. Arroyo D, Keyes D, Mahmoud A, Correa K, Hasan MS. Reevaluating the status quo: readiness to change lifestyle behaviors among patients who smoke. *Am J Lifestyle Med*. 2026;20(4):602–7. <https://doi.org/10.1177/15598276251351580>.
25. Ceccarini M, Borrello M, Pietrabissa G, Manzoni GM, Castelnovo G. Assessing motivation and readiness to change for weight management and control: an in-depth evaluation of three sets of instruments. *Front Psychol*. 2015;6:511. <https://doi.org/10.3389/fpsyg.2015.00511>.
26. Verheijden MW, Bakx JC, Delemarre IC, Wanders AJ, van Woudenberg NM, Bottema BJ, et al. GPs' assessment of patients' readiness to change diet, activity and smoking. *Br J Gen Pract*. 2005;55(515):452–7.
27. Abbasi Shaye Z, Mousavi Bazzaz M, Vakili V. A trans-theoretical approach to physical activity profile in general population of Mashhad. *Glob J Health Sci*. 2015;7(7 Spec No):46–54. <https://doi.org/10.5539/gjhs.v7n7p46>
28. O'Hea EL, Wood KB, Brantley PJ. The transtheoretical model: gender differences across 3 health behaviors. *Am J Health Behav*. 2003;27(6):645–56. <https://doi.org/10.5993/AJHB.27.6.7>.
29. Centis E, Moscatiello S, Bugianesi E, Bellentani S, Fracanzani AL, Calugi S, et al. Stage of change and motivation to healthier lifestyle in non-alcoholic fatty liver disease. *J Hepatol*. 2013;58(4):771–7. <https://doi.org/10.1016/j.jhep.2012.11.031>.
30. Centis E, Trento M, Dei Cas A, Pontiroli AE, De Feo P, Bruno A, et al. Stage of change and motivation to healthy diet and habitual physical activity in type 2 diabetes. *Acta Diabetol*. 2014;51(4):559–66. <https://doi.org/10.1007/s00592-013-0551-1>.
31. Wieser H, Vittadello F, Comploj E, Stummer H. Do health professionals sufficiently address patients' disposition toward changing their nutritional and physical activity habits? Findings from a pilot study among people with type 2 diabetes in Northern Italy. *Healthc (Basel)*. 2020;8(4):524. <https://doi.org/10.3390/healthcare8040524>.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Studyquestionnaire.docx](#)