



**EFFECTS OF A NUTRITION EDUCATION PROGRAMME ON
KNOWLEDGE, ATTITUDE, AND PRACTICE OF PHYSICAL ACTIVITY
AND NUTRITION AMONG FEMALE ADOLESCENTS IN SAUDI ARABIA**

By

ABEER AHMAD A BAHATHIG

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in
Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

November 2022

FPSK (p) 2022 50

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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November 2022

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Obesity and non-communicable diseases (NCDs) are associated with physical inactivity, sedentary behaviour (SB), unhealthy food consumption, disordered eating (DE) behaviour and body image (BI) dissatisfaction amongst young adolescents. Nevertheless, nutrition education programmes (NEPs) offered to young Saudi adolescents remain limited. This study determines the effects of a NEP on the knowledge, attitude and practice (KAP) of physical activity, nutrition and body image amongst young female adolescents in Arar, Saudi Arabia. Phase 1 of this work is a cross-sectional study involving 399 participants randomly selected from four schools and subjected to questionnaire and anthropometric measurements. The results (Phase 1) showed that 13% and 2.5% of the participants were overweight and obese, respectively, 88.5% had low physical activity (PA) and $\geq 90\%$ had high SB levels during weekends and weekdays. Moreover, most of the participants (89.7%) consumed excessive amounts of fat. DE was reported by 39.1% of the participants, and 18.5% reported BI satisfaction (BIS). Therefore, a NEP must be offered to female adolescents in Arar to improve their knowledge and behaviour towards PA, nutrition and BI. Phase 2 involves a cluster randomised controlled trial wherein schools and participants were randomly selected and assigned either to the intervention group (IG; n=68) or the control group (CG; n=70). The NEP consisted of a 60-minute seminar designed for the mothers of those students assigned to the IG; the seminar aims to help the mothers encourage their daughters to engage in PA, to eat healthy food and to display a positive BI. The IG received six 90-minute educational sessions on PA, nutrition and BI within three months, whereas the CG received the usual lessons. Both groups were assessed at baseline, during the post-test and at follow-up with the use of valid and reliable questionnaires prepared in the native language. A generalised estimating equation test and an interaction effect test (Time*Group) across time were conducted. The results showed that in the IG, there was an increase in the percentage of participants who engaged in vigorous PAs and who demonstrated reduced SB. Moreover, the knowledge, attitude, and practice (primary outcomes) of the IG significantly changed relative to those of the CG from the baseline

to follow up, with mean differences of -16.27, -51.33 and -35.20, respectively; moreover, the Time*Group interaction was significant ($p<0.001$). The IG also significantly differed from the CG in terms of secondary outcomes, namely, PA, SB during weekdays and weekends; consumption of dairy products, sweetened beverages, sweetened baked goods, and fruits and vegetables ($p<0.05$); DE ($p\leq 0.001$), except for bulimia; and BIS ($p<0.001$). The BMI-for-age z-score, waist circumference and energy and macronutrient intake did not significantly differ ($p>0.05$) between the groups. In summary, the NEP effectively improved the KAP, PA, dietary intake and BIS and decreased the SB and DE amongst the female adolescents in Arar. These results demonstrated the soundness of integrating the NEP into the Saudi curriculum to increase the awareness of young Saudi female adolescents about PA, nutrition and BI in order to reduce the prevalence of obesity and NCDs.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KESAN PROGRAM PENDIDIKAN PEMAKANAN TERHADAP
PENGETAHUAN, SIKAP, DAN AMALAN AKTIVITI FIZIKAL DAN
PEMAKANAN DALAM KALANGAN REMAJA PEREMPUAN DI ARAB
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Obesiti dan penyakit tidak berjangkit telah dikaitkan dengan kurangnya aktiviti fizikal, tingkah laku sedentari (SB), makanan tidak sihat, kekeliruan pemakanan (DE), dan ketidakpuasan imej tubuh (BI) dalam kalangan awal remaja. Walau bagaimanapun, program pendidikan pemakanan (NEP) dalam kalangan remaja Saudi masih lagi terhad. Kajian ini bertujuan untuk menentukan kesan NEP ke atas pengetahuan, sikap, dan amalan aktiviti fizikal, tahap pemakanan, dan imej tubuh dalam kalangan remaja perempuan Saudi di Arar, Arab Saudi. Pada Fasa 1, kajian keratan rentas telah dijalankan dalam kalangan 399 peserta yang dipilih secara rawak dari empat buah sekolah, dan dinilai melalui soal selidik dan pengukuran antropometri. Keputusan (Fasa 1) menunjukkan bahawa 13.0% dan 2.5% peserta masing-masing mempunyai berat badan berlebihan atau obes, 88.5% mempunyai tahap aktiviti fizikal (PA) yang rendah, dan $\geq 90\%$ mempunyai tahap SB yang tinggi pada hujung minggu dan pada hari bekerja. Tambahan pula, kebanyakan peserta (89.7%) mengambil makanan berlemak secara berlebihan. Prevalens DE ialah 39.1%, manakala 18.5% menunjukkan kepuasan BI (BIS). Oleh itu, remaja perempuan Saudi di Arar memerlukan NEP untuk meningkatkan tahap pengetahuan dan tingkahlaku terhadap PA, pemakanan dan BI. Pada Fasa 2, kajian terkawal terawak kluster telah dijalankan. Sekolah dan peserta telah dipilih secara rawak dan dibahagikan secara rawak kepada kumpulan intervensi (IG; n=68) dan kumpulan kawalan (CG; n=70). NEP merangkumi seminar selama 60 minit yang diberikan kepada ibu kepada peserta bagi membantu ibu untuk mengalakkan anak mereka mengamalkan PA, mengambil makanan sihat dan mendapatkan BI yang positif. Kumpulan IG juga menerima enam kali sesi pendidikan 60 minit setiap sesi berkaitan PA, pemakanan dan BI dalam tempoh tiga bulan. Kumpulan kawalan pula menerima program pendidikan yang sedia ada. Kedua-dua kumpulan telah dinilai sebelum intervensi diakhir intervensi dan pasca intervensi, soal selidik yang sah dan *reliable* menggunakan berbahasa natif peserta. Ujian *generalised estimating equation* dan ujian kesan interaksi (Masa*Kumpulan) rentas masa telah dijalankan. Keputusan menunjukkan didalam

kumpulan IG, terdapat peningkatan peratusan peserta PA yang lebih tinggi dan mengurangkan jumlah masa SB. Selain itu, pengetahuan, sikap, dan amalan (dapatan utama) dalam kumpulan IG berbeza secara signifikan berbanding dengan CG pada sebelum intervensi berbanding pengukuran susulan, dengan perbezaan min masing-masing adalah -16.27, -51.33 dan -35.20; tambahan pula dengan keputusan interaksi (Masa*Kumpulan) yang signifikan ($p<0.001$). IG juga didapati berbeza daripada CG dari segi keputusan sekunder, iaitu, PA, SB pada hari bekerja dan hujung minggu; pengambilan produk tenusu, minuman manis, produk manisan yang dibakar, dan buah-buahan dan sayur-sayuran ($p<0.05$); DE ($p\leq 0.001$), kecuali bulimia; dan BIS ($p<0.001$). Skor-z BMI-untuk-umur lilitan pinggang dan pengambilan tenaga serta makronutrien, tidak berbeza secara signifikan ($p>0.05$) di antara kumpulan. Kesimpulannya, NEP berkesan meningkatkan KAP, PA, pengambilan makanan dan BIS dan mengurangkan SB dan DE di kalangan remaja perempuan di Arar. Keputusan ini menunjukkan kebaikan mengintegrasikan NEP ke dalam kurikulum di Saudi untuk meningkatkan kesedaran remaja perempuan Arab Saudi mengenai PA, pemakanan dan BI untuk mengurangkan prevalen obesiti dan NCD.

ACKNOWLEDGEMENTS

In the name of Allah, and praise is to Allah before everything, praise is to Allah after everything, praise be to Allah who gave me the patience and ability to complete this work.

I dedicate my research to my dear father and my beloved mother, the greatest gifts of the Most Gracious, and I pray you always be proud of me. I dedicate the outcome of my efforts to the most precious in my life, my children Hanar, Lamar, Abdullah, and Mayar, who endured the pain of distance for the sake of my studies. I dedicate this thesis to whom I love, my brothers, sisters and their children, who never stopped supporting me.

For assistance in completing this thesis, I would like to acknowledge many persons. First of all, I offer my thanks and gratitude to my supervisor, Assoc. Prof. Hazizi Abu Saad, for his valuable guidance, patience, and helping me during my PhD's journey. Furthermore, co-supervisors Dr. Nor Baizura Md Yusop, Dr. Nurul Husna Mohd Shukri, and Prof. Dr. Maha M. Essam El-Din, I would like to thank them for their support and guidance in developing this research.

Finally, I will never forget to thank those friends who encouraged and helped me morally. They are the faithful brothers and sisters that words cannot express. Thank you for being in my life.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

\geq	Greater than or equals to
\leq	Less than or Equals to
%	Percentage
α	Cronbach's Alpha Coefficient
β	Beta
BAZ	BMI-for-age-z-scores
BI	Body Image
BID	Body Image Dissatisfaction
BMI	Body Mass Index
BIS	Body Image Satisfaction
CDC	Center for Disease Control and Prevention
CG	The Control Group
CI	Confidence Interval
DE	Disordered Eating Behaviour
EAT-26	The Eating Attitudes Test 26
ED	Eating Disorder
FAO	Food and Agriculture Organization
GEE	Generalized Estimating Equation
h	Hour
h/day	Hour per Day
HBM	The Health Believe Model
IG	The Intervention Group
KAP	Knowledge, Attitude, and Practice
KAPQ	Knowledge, Attitude, and Practice Questionnaire
Kg	Kilogram

KSA	Kingdom of Saudi Arabia
min/day	Minutes per Day
MVPA	Moderate to Vigorous Physical Activity
n	Number
N	Number
NCDs	Non-Communicable Diseases
PA	Physical Activity
PAQ-C	Physical Activity Questionnaire for Older Children
RCT	Randomised controlled trial
SAR	Saudi Arabia Riyal
SB	Sedentary Behaviour
SCT	The Social Cognitive Theory
SD	Standard Deviations
SFFQ	Semi-quantitative Food-Frequency Questionnaire
SSB	Sugar Sweetened Beverages
TTM	The Transtheoretical Model
TPB	Theory of Planned Behaviour
vs	versus
WC	Waist Circumference
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Obesity is the most critical public health issue of the twenty-first century (El-Gazzar et al., 2019). According to the World Health Organization (WHO) (2022), obesity is primarily characterised by abnormal accumulation of body fat. Obesity and overweight are amongst the leading causes of ischaemic stroke and non-communicable diseases (NCDs) (e.g. heart diseases, high cholesterol, type 2 diabetes and insulin resistance-related problems) (WHO, 2022). Over the last four decades, the number of obese children aged 5–19 increased by tenfold worldwide. If this trend persists, many will suffer from the consequences of this health condition (WHO, 2017). The Centre for Disease Control and Prevention (CDC) (2021) has reported that between 2017 and 2018, approximately 14.4 million Americans aged 2–19 were obese. In Europe, one out of three children is overweight or obese (Bell et al., 2019). The situation in Arab countries (e.g. Yemen, the United Arab Emirates, Egypt and Iraq) is no better, as an increasing prevalence of obesity has also been reported (Lobstein & Brinsden, 2019). Musharrafieh et al. (2020) found that in the Kingdom of Saudi Arabia (KSA), 30% of Saudis aged 10–18 are obese or overweight.

Physical inactivity and consumption of calorie-dense foods containing fat and sugar are the main factors that contribute to obesity and overweight (WHO, 2021). In Colombia, 87.7% of adolescents aged 11–18 do not meet the recommended duration of physical activity (PA) of 60 min/day (Galindo-Perdomo et al., 2021). Similarly, 35.7% of female Brazilian adolescents do not engage in PA (Bento et al., 2020). Despite the benefits of PA, a mere 26.3% of Saudi females are committed to engaging in 60 min/day of PA (Mohamed et al., 2020). Young females have also been observed to be less active than young males (Al-Agha & Mahjoub, 2018).

Sedentary behaviour (SB) has also become increasingly common and is highly prevalent amongst children and adolescents in several countries, including Iran, Qatar, Kuwait and Australia (Azabdaftari et al., 2020, Kerkadi et al., 2019, Hashem et al., 2018; Shakir et al., 2018), respectively. Although the American Academy of Paediatrics recommends that screen time should not exceed two hours/day (h/day) (American Academy of Pediatrics, 2001), more than 85% of Saudi female adolescents are sedentary for more than 3 h/day (Alzamil et al., 2019). SB has been found to affect the human body by decreasing the duration of sleep and by increasing the risk of cancers, type 2 diabetes and cardiovascular diseases (WHO, 2020).

As regards fat consumption, in Asian countries such as China and Korea, the daily consumption of fat exceeds the recommended amount (WHO, 2022; Song & Shim, 2019). Although it has been well established that a healthy diet will help maintain a

normal weight, children in the Middle East consume low levels of micronutrients and high levels of fat (Albataineh et al., 2019). For example, 40.3% of Saudi adolescents report consuming burgers at least once a week (Aljamani et al., 2020).

Meanwhile, disordered eating (DE) behaviour is manifested in excessive binge eating, use of diuretics, self-induced vomiting and weight loss, among others (Bannatyne et al., 2018). The prevalence of DE amongst adolescents was reported to be 23.56% in India (Gaddad et al., 2018) and 51.7% in Australia (Wilksch et al., 2020). In Arab countries, the prevalence of DE has increased to 28.6% in Palestine (Saleh et al., 2018) and to 40.4% in Jordan (Al-Kloub et al., 2019). DE has become fairly common amongst Saudi adolescents, as approximately 43.1% of them suffer from DE (Almuhlaifi et al., 2018), and the body image (BI) satisfaction (BIS) level amongst the majority of Saudi female adolescents is less than acceptable. The above findings indicate that BI dissatisfaction (BID) is linked to DE and obesity (Almuhlaifi et al., 2018). The lack of knowledge of PA and proper diet amongst Saudi female adolescents has contributed to an increase in physical inactivity and in the irregular consumption of substantial amounts of food, even in situations where hunger is not an issue (El Azab et al., 2019).

The health policy of the Ministry of Health of KSA (2021) asserts that a healthy diet for students promotes good memory development, sound mental and physical performance and strong immunity against diseases. A balanced diet should consist of macronutrients, vitamins, minerals and water. Also, nutrition education programme (NEP) should include PA as a critical component, rendering the NEP to be in alignment with the national nutritional strategy of KSA. The national nutritional strategy of KSA for 2014–2025 consists of the recording of students' weight and height, enhancement of their food label reading proficiency, and provision of education that increases their knowledge of PA and nutrition. Indeed, the conduct of seminars, workshops and sessions on specific topics (e.g. consumption of fruits, vegetables and fats) can go a long way in promoting the health of students (Ministry of Health KSA, 2014).

Prior to 2018, according to Al-Hazzaa & AlMarzooqi (2018), the Saudi Ministry of Health conducted public awareness campaigns in public places and used visual media to educate mixed-age populations (including young adolescents) in major cities, such as Riyadh and Jeddah. Also, the slogan 'Your health should be worth everything to you' was promoted to highlight the importance of PA and balanced diet in reducing body weight and the prevalence of NCDs. In support of the initiative to encourage engagement in PAs, the constituent municipalities of these cities have developed more parks and walking trails. In 2005–2006, 'Harka Baraka' programme was conducted amongst children aged 6–12 in government schools to increase their knowledge about PA and nutrition. For example, the daily PA recommendations amount and serving food size. However, this programme was not maintained due to lack of funding. Moreover, the Ministry of Education launched an initiative called 'Tatweer' to promote PA in schools for female children and adolescents; this initiative was implemented along with an education programme called 'Health-Promoting Schools'. Despite the success of these programmes, some efforts were hampered by poor coordination, lack of proper interpretations of outcomes, the need to discourage SB and the unsuitability of the process for young adolescents. However, it was observed that the procedures employed

were more applicable to adolescent males than to adolescent females (Al-Hazzaa & AlMarzooqi, 2018).

Many studies that aimed to encourage PA and reduce SB have been conducted (Hashemian et al., 2021; Mahajan et al., 2021; Sebire et al., 2018). Efforts have also been made to encourage the adoption of positive BI by promoting the intake of healthy food or by discouraging the intake of unhealthy food (Beintner et al., 2019; Dunstan et al., 2017; Florence et al., 2020; Partida et al., 2018; Sharif Ishak et al., 2020; Sundgot-Borgen, 2020). Studies have strongly proven that educational interventions are applicable to adolescents and that they are effective. Altering one's behaviour through knowledge is one of the most essential pillars in promoting positive attitudes that drive behavioural changes (El Harake et al., 2018; Florence et al., 2020; Habib-Mourad et al., 2020; Jadgal et al., 2020; Liu et al., 2019; Shabani et al., 2018).

Several researchers have focused on NEPs related to PA, nutrition and BI for female adolescents. These programmes come in the form of educational sessions, brochure distribution, purposeful games and PowerPoint presentations, and significant positive changes have been reported. Thus, schools are an ideal avenue for implementing education programmes that help young female adolescents to alter their behaviour. The current study aims to determine the effects of a NEP on the knowledge, attitude and practice (KAP) of PA, nutrition and BI amongst young female adolescents in Arar, KSA.

1.2 Statement of the Problem

The laying down of foundations for good health is crucial for adolescents. The issues related to obesity and overweight are the risk factors for NCDs, morbidity and mortality (WHO, 2022). These issues have rapidly become a growing concern in children and adolescents in developing and developed countries (WHO, 2022). Lobstein and Brinsden (2019) opined that in the next decade, the number of obese children aged 5–19 is expected to rapidly increase to 206 million by 2025 and to 254 million by 2030 globally. In KSA, the risk score for obesity is high, and approximately 1,296,075 Saudi children aged 10–19 years will be obese by 2030. Currently, approximately 32.8% of Saudi adolescent females are overweight/obese (Al-Hazzaa and Albawardi, 2021).

Over the past three decades, the political, economic and social environments in KSA have changed rapidly, which negatively influenced the health, PA, nutrition and diet, and SB of the population (Al-Hazzaa, 2018; Shatwan et al., 2022). Most adolescents who regularly engage in PA and who consume healthy food tend to display a positive BI (Sharif Ishak et al., 2016). However, a study showed that 95% of the Saudi participants had limited awareness and knowledge about healthy diet (Halimic et al., 2018). This finding indicated that Saudi adolescents will benefit from educational interventions on healthy lifestyle and dietary habits. These adolescents should also be made fully aware of the serious complications that come with obesity (Aljamani et al., 2020; Halimic et al., 2018).

Recent studies have indicated that only 4.1% of Saudi adolescents engage in vigorous levels of PA (Alharbi, 2019), whereas 64% engage in low levels of PA (Aljamani et al., 2020; Mahfouz et al., 2020). According to Baqal et al. (2020), nearly half of Saudi adolescents engage in low levels of PA. Engagement in PA has been found to be significantly prevented by SB. (Gaddad et al., 2018). In fact, 97.9% of females in KSA spend most of their time being sedentary (Alahmadi, 2021), consistent with the finding that female Saudi adolescents spend >4 h/day for screen time (Alturki et al., 2020).

Recent studies have indicated that consumption of unhealthy food has become common amongst Saudi adolescents (Jouhar et al., 2021). Approximately 50% of Saudi female adolescents consume unhealthy snacks, such as sweets and sweetened beverages, on a daily basis. This means that they do not follow the daily recommended dietary intake for Saudis (Alkhalidi et al., 2021; Jouhar et al., 2021; Mahmood, 2018). Furthermore, 49.5% of adolescents aged 13–18 consume fast food and rice at least once a week (Aljamani et al., 2020). Saudi female adolescents should be informed of the benefits of eating healthy and the consequences of unhealthy eating. To that end, education programmes that aim to improve nutritional intake are essential in ensuring life free from serious ailments (Alzamil et al., 2019). As for the implemented NEP that revolves around PA and SB and which targets female adolescents, it will become more effective when conducted in a school setting (Sebire et al., 2018) given the increasing number of students and the available facilities (El Harake et al., 2018; Lubans et al., 2016).

Obesity is significantly related to DE (Barrack et al., 2018) and BID (Almuhlaifi et al., 2018). In a study involving 396 female Saudi university students, 36.8% registered an EAT-26 score of >20 (Albrahim et al., 2019). In 2018, Latiff et al. (2018) has found that 60.1% of young Saudi adolescents are not satisfied with their body shape. This percentage has increased to 87% in Albawardi's et al. (2021) report. Therefore, Saudi adolescents, particularly females, will benefit from education programmes revolving around DE and BI as a means of promoting healthy lifestyles (Baceviciene et al., 2020; Taha et al., 2018).

In KSA, individuals aged 11–17 are considered adolescents (Ministry of Health KSA, 2019). The best age for adolescents to learn about PA and healthy eating and to adopt a behavioural change is 12–14, the age range for young adolescents CDC, 2021; Hawks et al., 2022). According to The Saudi Ministry of Education, primary school children are those aged 7–12; this means those aged 11–12 might be exposed to NEPs for which they are not yet suitable. Intermediate schools have adolescents aged 13–15, and 13–14-year-olds are best suited for NEPs. Female participants were selected for this study, as males attend separate schools in KSA (Ministry of Education KSA, 2022). Furthermore, most young female adolescents will become mothers in the future, and their PA and healthy eating behaviours are significantly influenced by their mothers (Hawks et al., 2022). Thus, NEPs are more appropriate for young female adolescents.

Studies have provided recommendations for education programmes that promote improvements in the KAP, body mass index (BMI), waist circumference (WC), PA, SB, dietary intake, DE, and BIS of adolescents, ultimately improving their lifestyles (Dunstan

et al., 2017; El Harake et al., 2018; Florence et al., 2020; Salem & Said, 2018; Sharif Ishak et al., 2020; Partida et al., 2018). The current school curricula in KSA does not tackle PA, nutrition and BI (Ministry of Education KSA, 2021). Moreover, most of the existing Saudi studies were conducted in large cities, such as Tabuk, Riyadh, and Al-Madinah, and they involved female adolescents aged 9–19 (Alamri, 2017; Fetohy et al., 2020; Hefni, 2017). A nutrition-based study in Arar recommends that more education programmes on PA and nutrition must be developed (Alasqah et al., 2021; Alenazi et al., 2015; Fatima & Ahmad, 2018).

The NEP developed for this study is the first education programme developed for Saudi female adolescents aged 13–14; this NEP covered KAP, BMI, WC, PA, SB, dietary intake, DE and BIS. The main objective of this study was to determine the effects of the NEP on the KAP of PA, nutrition and BI among young female adolescents in Arar, KSA.

1.3 Significance of the Study

This study aims to determine the effects of the NEP on the KAP of PA, nutrition and BI amongst young female adolescents in Arar, KSA. The Ministry of Education and the Ministry of Health in Arar may use the study findings to increase awareness on the KAP of PA, nutrition and BI of the target population.

The present results showed that the NEP greatly improved the KAP of PA, nutrition and BI. This indicates that the NEP will improve the engagement in PA, the dietary intake and the BIS, as well as reduce the BMI, WC, SB and DE of young female adolescents in Arar. School teachers may receive training to increase their knowledge on PA, nutrition and BI and then pass the knowledge they have acquired to young female adolescents. This programme can reduce the prevalence of overweight, obesity and NCDs, which arise due to low levels of PA and due to consumption of unhealthy food.

The present findings may also be useful to the Ministry of Education in Arar in developing educational curricula that will encourage young female adolescents to become physically active, to consume healthy food and to adopt positive BI. Given that female adolescents are the future of a nation, it is crucial that their habits and behaviours promote healthy lifestyle. Moreover, this study can provide the Ministry of Health in Arar with detailed information on how to develop counselling programmes and what materials, facilities and workshops to offer to promote the adoption of healthy practices that prevent obesity and NCDs in the said population.

The data obtained in this NEP are useful to future researchers who will implement NEPs on PA, nutrition and BI and promote obesity prevention amongst female and male individuals of different ages from various cities based on their need's assessment. This NEP can motivate other researchers to conduct similar studies involving similar population in Arab and Asian countries according to their needs assessment and then

compare their results with those of other studies. Other variables and theories may be applied to increase the findings.

1.4 Research Questions

The research questions for this study are:

- a. What are the prevalent of body weight status (body mass index and waist circumference) (anthropometric measurements), physical activity, sedentary behaviour, dietary intake, disordered eating, and body image satisfaction (lifestyle factors) to develop a nutrition education programme on knowledge, attitude, and practice of physical activity, nutrition and body image among young female adolescents in Arar, Saudi Arabia? (Phase 1)
- b. What are the effects of nutrition education programme on knowledge, attitude, and practice of physical activity, nutrition and body mass index and waist circumference (anthropometric measurements), physical activity, sedentary behaviour, dietary intake, disordered eating, and body image satisfaction (lifestyle factors) within and between the intervention and control groups at baseline, post-test, and 3-month follow-up after post-test? (Phase 2)

1.5 Research Objectives

This section addressed the general and specific objectives of this research.

1.5.1 Phase 1

1.5.1.1 General Objective

- a. To develop a nutrition education programme on knowledge, attitude, and practice of physical activity, nutrition and body image among young female adolescents in Arar, Saudi Arabia.

1.5.1.2 Specific Objectives

- a. To determine the prevalent of body weight status (body mass index and waist circumference) (anthropometric measurements), physical activity, sedentary behaviour, dietary intake, disordered eating, and body image satisfaction (lifestyle factors) among young female adolescents in Arar, Saudi Arabia.

1.5.2 Phase 2

1.5.2.1 General Objective

- a. To determine effects of nutrition education programme on knowledge, attitude, and practice of physical activity, nutrition and body image among young female adolescents in Arar, Saudi Arabia.

1.5.2.2 Specific Objectives

- a. To compare the differences within and between the intervention and control groups at baseline, post-test, and 3-month follow-up after post-test in:
 - 1- Primary outcomes:
 - Knowledge, attitude, practice of physical activity, nutrition and body image.
 - 2- Secondary outcomes:
 - Body mass index and waist circumference (anthropometric measurements).
 - Physical activity, sedentary behaviours, dietary intake, disordered eating, and body image satisfaction (lifestyle factors).

1.6 Research Hypothesis

The alternative hypothesis for Phase 1 and 2 in this study are:

1.6.1 Phase 1

- a. There is a need to develop a nutrition education programme on knowledge, attitude, and practice of physical activity, nutrition and body image to improve body weight status (body mass index and waist circumference) (anthropometric measurements), physical activity, sedentary behaviour, dietary intake, disordered eating, and body image satisfaction (lifestyle factors) among young female adolescents in Arar, Saudi Arabia.

1.6.2 Phase 2

- a. There is a significant improvement within and between the intervention and control groups in mean scores of knowledge, attitude, and practice in the intervention group compared to the control group at baseline, post-test, and 3-month follow-up after post-test.
- b. There is a significant improvement within and between the intervention and control groups in body weight status (body mass index and waist circumference) (anthropometric measurements) and physical activity, sedentary behaviour, dietary intake, disordered eating, and body image satisfaction (lifestyle factors) at baseline, post-test, and 3-month follow-up after post-test.

1.7 Research Conceptual Framework

Figure 1.1 shows the conceptual framework for this study. Unhealthy lifestyle behaviours are prevalent among young female adolescents (Beintner et al., 2019; Florence et al., 2020; Habib-Mourad et al., 2020; Salem & Said, 2018; Sharif Ishak et al., 2020; Teo et al., 2021; Yi, 2016), which indicated young female adolescents lack nutrition education in relation to these essential factors. The prevalence of BAZ and WC (anthropometric measurements) and PA, SB, dietary intake, DE and BIS (lifestyle factors) was determined in this study, and the development of the NEP was conducted by the social cognitive theory (SCT) (Phase 1). The effects of the NEP amongst the students in the IG who received the programme were determined and were analysed with respect to the results for the CG, which received the conventional education and usual PA (Phase 2). This NEP aims to significantly improve the primary outcomes, namely, KAP on PA, nutrition and BI, which in turn improved the secondary outcomes, namely, BAZ and WC (anthropometric measurements) and PA, SB, dietary intake, DE and BIS (lifestyle factors) amongst young Saudi female adolescents in the IG compared with those in the CG. A young female adolescent who acquired sound knowledge is more likely to alter her behaviour and adopt a healthy lifestyle, which will go a long way in keeping her from developing obesity and NCDs. A young adolescent female will become a mother in the future, and mothers greatly influence their children's PA and nutrition behaviour (Hawks, 2022). Therefore, the obesity issue must be addressed by focusing more on female adolescents.

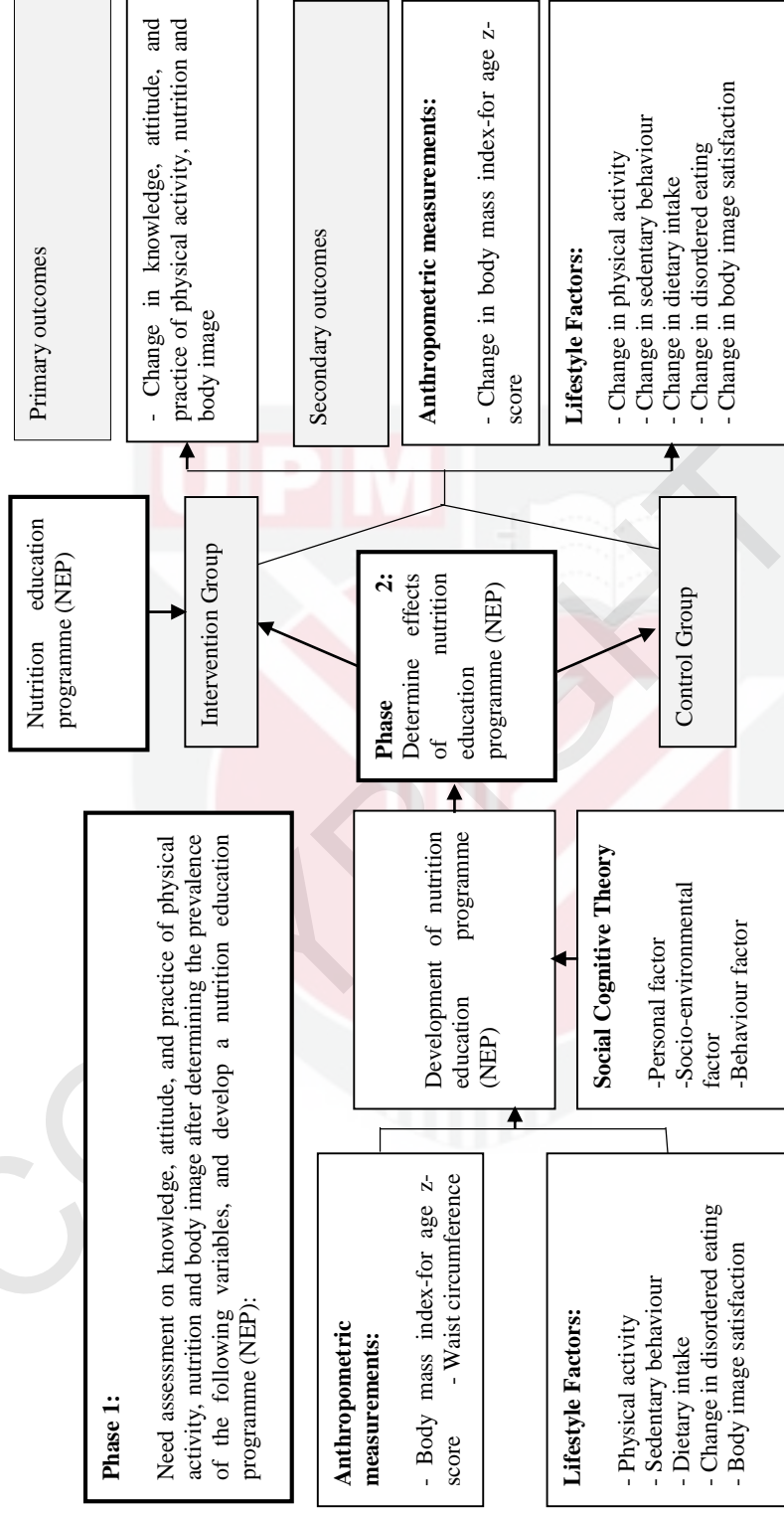


Figure 1.1: Conceptual Framework of Study

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