EFFECTIVENESS OF DIET AND EXERCISE INTERVENTION PROGRAMMS ON CARDIOVASCULAR DISEASE RISK FACTORS AMONG POSTMENOPAUSAL IRANIAN WOMEN

PARVIN ABEDI

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By
PARVIN ABEDI

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

November 2009
Dedicated

To

This thesis is dedicated to my lovely children Mahdis, Pardis and Sepideh, my dear husband Abbas, and my father Alireza that I owe them all of success in my life.
EFFECTIVENESS OF DIET AND EXERCISE INTERVENTION PROGRAMS ON CARDIOVASCULAR DISEASE RISK FACTORS AMONG POSTMENOPAUSAL IRANIAN WOMEN

By

PARVIN ABEDI

November 2009

Chairman: Dr Mary Huang Soo Lee, PhD
Faculty: Medicine and Health Sciences

Cardiovascular disease (CVD) is one of the major complications in menopausal women internationally. CVD, including heart diseases and stroke, are the leading causes of death, and is now a leading cause of death and disability in Iran.

The aim of this study was to evaluate the effect of diet and exercise educational intervention on improving cardiovascular risk factors among postmenopausal Iranian women.

This study started on June 2007 and was completed on May 2008. The study was carried out with participants recruited in a Health clinic in Ahvaz Iran. A total of 136 postmenopausal women were randomly assigned to four groups namely; exercise (38), diet (35), diet+ exercise (34) and control groups (29). The anthropometric, biochemical,
health beliefs, physical activity and dietary intake of participants were measured at baseline and after six months.

Over the six months intervention period, the three intervention groups received a multi-component educational intervention consisting of one face-to-face education, three lecture discussion sessions and group counseling sessions (every week in the first month). They were also received three booklets about menopause, CVD, healthy diet and exercise with emphasis on components of Health Belief Model (HBM), monthly telephone reminders (each month after the first month) and individual counseling midway at the 3rd month. The control group received booklets only. Baseline and 6th month assessments were conducted by using the same questionnaires (interview-administered format).

After six months intervention there was a significant positive change (P<0.05) in the physical activity level in the exercise group, perception of participants about seriousness, vulnerability, benefits, cues to action and barriers toward CVD in all three intervention groups. Also the dietary fiber, vitamin C and E intakes and distribution of participants who consumed ≥5 servings fruit and vegetable in the diet and diet + exercise group increased significantly. The intervention improved some CVD risk factors significantly within groups in the following areas: Weight and BMI was reduced in the diet group, hip circumference decreased in the exercise and diet groups. The level of LDL decreased in the exercise group, VLDL and FBS decreased in the exercise and diet groups. The intake of protein increased in the diet + exercise group. Intake of monounsaturated fat increased in the exercise, diet and diet + exercise groups. Poly
unsaturated fat and saturated fat intake decreased in the exercise group. The intake of vitamin A increased in the diet + exercise group and intake of calcium increased in the diet and diet + exercise groups.

In conclusion the results of this study showed that six months of educational intervention on physical activity and diet could improve some risk factors of CVD in postmenopausal women. The diet and diet + exercise groups could reduce CVD risks more than the group that only exercised. Therefore, the implementation of healthy diets for postmenopausal women should be encouraged.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KEBERKESANAN PROGRAM PENDIDIKAN DIET DAN SENAMAN TERHADAP FAKTOR-FAKTOR RISIKO PENYAKIT KARDIOVASKULAR DI KALANGAN WANITA IRAN YANG PUTUS-HAID

Oleh

PARVIN ABEDI

November 2009

Pengerusi: Dr Mary Huang Soo Lee, PhD

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Penyakit kardiovaskular (CVD) adalah salah satu masalah besar di kalangan wanita putus-haid di seluruh dunia. Penyakit kardiovaskular termasuk penyakit jantung dan strok adalah punca utama kematian dan juga merupakan punca utama kemation dan kecacatan di Iran.

Tujuan kajian ini adalah untuk menilai kesan pendidikan diet dan senaman dalam memperbaiki factor-faktor risiko kardiovaskular di kalangan wanita Iran yang putus-haid.

kepada empat kumpulan yang dinamakan kumpulan senaman, diet, senaman diet, dan kawalan (n=38, n=35, n=34 and n=29 mengikut kumpulan yang tertera).

Sepanjang tempoh kajian selama enam bulan, tiga kumpulan kajian telah didedahkan kepada kaedah bersemuka, sesi kuliah dan perbincangan, sesi kaunseling berkumpulan, (setiap minggu pada bulan pertama) peringatan melalui panggilan telefon. Tiga buku berkaitan putus haid dan CVD, serta diet sihat bersama senaman dangan penekanan terhadap Health Belief Model (HBM), telah diedarkan kepada peserta dan kaunseling secara individu diadakan pada bulan ketiga kajian tersebut. Kumpulan kawalan hanya menerima buku panduan sahaja. Penilaian pada peringkat awal dan selepas enam bulan dijalankan menggunakan borang soal selidik yang sama iaitu melalui kaedah temubual.

Selepas kajian selama enam bulan, intervensi terdapat perubahan positif yang signifikan (P<0.05) pada tahap aktiviti fizikal dalam kumpulan senaman, persepsi kumpulan kajian terhadap kesungguhan, kebarangkalian mendapat penyakit CVD, kebaikan, arahan bertindak dan halangan terhadap CVD dalam semua kumpulan kajian. Pengambilan fiber, vitamin C dan E dan distribusi peserta yang mengambil ≥ 5 hidangan sayor dan buah-buahan di dalam kumpulan diet dan diet + senaman meningkat secara signifikan. Kajian ini memperbaiki sesetengah risiko CVD secara signifiken di dalam kumpulan kajian seperti yang berikut: berat badan dan BMI menerum di dalam kumpulan diet, ukar lilitan pinggang menurun di dalam kumpulan senaman + diet, paras LDL menurun kumpulan senaman manakala VLDL dan FBS menurun dengan kumpulan. Pengambilan protein meningkat dalam kumpulan diet+senaman. Pengambilan lemak-mono-tak tepu meningkat dalam kumpulan senaman, diet, dan diet + senaman. Pengambilan lemak-
poli-taktepu dan lemak tepu menurun dalam kumpulan senaman. Pergambilan vitamin A meningkat di dalam kumpulan diet dan senaman dan pengambilan kalsium meningkat di dalam kumpulan diet serta di dalam kumplan diet + senaman.

Secara kesimpulannya, keputusan kajian ini menunjukkan bahawa kajian selama enam bulan aktiviti fizikal dan diet telah dapat mengubah sebahagian daripada faktor risiko CVD di kalangan wanita putus haid. Kumpulan diet dan kumpulan diet dan senaman dapat mergurang kan risiko CVD lebih daripada kumpulan yang hanya bersenam. Oleh itu, pendekatan pemakanan yang sihat untuk wanita putus haid haruslah digalakkan.
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I wish to express my sincere appreciation and gratitude to my supervisor, Assoc. Professor Dr. Mary Huang Soo Lee for her supervision, constructive suggestions and immense amount of guidance throughout this study. Appreciation is extended to the members of my supervisory committee, Assoc. Professor Dr. Zaitun Yassin, Assoc. Professor Dr. Mirnalini Kandiah and Professor Dr. Davood Shojaeezadeh for their guidance during this study. Thanks also to the Medical University of Gondi-Shapor in Ahvaz-Iran for their cooperation during the data collection.

I wish to convey my gratitude to my parents for their encouragement and spiritual support during the whole of my life. And last but certainly not least, I wish to express my deep gratitude and heartfelt appreciation to my husband, my children especially Mahdis and my sister Shahla for their immense support, understanding and sacrifices that have made the task of completing this project possible. Thanks also to my friends Firoozeh and Sahar that helped during my study in Malaysia.
I certify that an Examination Committee met on 20/11/2009 to conduct the final examination of Parvin Abedi on her Doctor of Philosophy thesis entitled “Effectiveness of diet and exercise intervention programmes on cardiovascular disease risk factors among postmenopausal Iranian women” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The committee recommends that the candidate be awarded the relevant degree.

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotation and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institution.

Parvin Abedi

PARVIN ABEDI

Date: 16/6/2009
# TABLE OF CONTENT

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ix</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>x</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xviii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xxi</td>
</tr>
</tbody>
</table>

## CHAPTER

### 1 INTRODUCTION

1.1 Background 1
1.2 Problem Statement 3
1.3 Conceptual Framework of the Study 7
1.4 Importance of the Study 9
1.5 Objectives of the Study 10
1.6 Null Hypotheses 12

### 2 LITERATURE REVIEW

2.1 Introduction 15
2.2 Menopause 15

2.2.1 Population of Menopause Women 15
2.2.2 Age of Menopause 16
2.2.3 Menopause Changes and CVD 17
2.2.4 Menopause and Lipid Profile Changes 18
2.2.5 Effect of Menopause on Blood Pressure 20
2.2.6 Effect of Menopause on Weight Status 21

2.3 Cardiovascular Disease 22

2.3.1 Prevalence of CVD 23
2.3.2 Pathophysiology of CVD 24
2.3.3 Risk Factors for CVD 26
2.3.4 Obesity and CVD 27
2.3.5 Plasma Triglyceride and CVD 30
2.3.6 C Reactive Protein (CRP) and CVD 31
2.3.7 Lipoprotein (a) and CVD 31
2.3.8 Insulin Resistance and CVD 32
2.3.9 Metabolic Syndrome and CVD 32
2.3.10 Hypercholesteremia and CVD 34
2.3.11 Hypertension and CVD 35
2.4 Prevention of CVD
  2.4.1 Exercise
  2.4.2 Aerobic and Anaerobic Exercise
  2.4.3 Lack of Exercise
  2.4.4 Benefits of Regular Exercise on CVD Risk Factors

2.5 Health Behavior Models
  2.5.1 Transtheoretical Model
  2.5.2 Social Learning Theory
  2.5.3 Health Promotion Model
  2.5.4 Reasoned Action Theory
  2.5.5 Health Belief Model

2.6 Exercise and CVD
  2.6.1 Determinants of Physical Activity and Benefits

2.7 Diet intervention and CVD Risk Factors

2.8 Combination of diet plus Exercise Intervention and CVD

2.9 Summary

3 METHODOLOGY

3.1 Ethical Consideration

3.2 Location of the Study

3.3 Sample Size Calculation

3.4 Study Design

3.5 Screening and Recruitment of Participants

3.6 Recruitment and Retention

3.7 Randomization

3.8 Instruments
  3.8.1 Questionnaire
  3.8.2 Development of questionnaire

3.9 Measurements
  3.9.1 Anthropometry
  3.9.2 Biochemical Tests
  3.9.3 Physical Activity
  3.9.4 Dietary Intake
  3.9.5 The Health Belief Model

3.10 Intervention
  3.10.1 Development of Educational Material
  3.10.2 Content of Educational Materials
  3.10.3 Diet
FBS after Intervention
4.3.3 Blood Pressure Measurements after Intervention 136
    Changes in the Distribution of Participants 137
    with Hypertension after Intervention
4.3.4 Macronutrient Intake after Intervention 140
    Energy from Macronutrients after Intervention 147
4.3.5 Micronutrient Intake of Participants after Intervention 151
4.3.6 Food Frequency Mean Scores of Participants after 157
    Intervention
4.3.7 Changes in Energy Expenditure (MET-minutes/week) of 158
    Participants after Intervention
    Distribution of Participants According to 159
    Physical Activity level after Intervention
4.3.8 Changes in the Mean Scores of the Health Belief Model 162
    Components after Intervention
4.3.9 Distribution of Participants According to Dietary Risk 168
    Factors after Intervention
4.4 Relationship of Study Outcomes with the Health Belief 174
    Model Components

5 CONCLUSION AND RECOMMENDATION 178
5.1 Conclusion 178
5.2 Strengths and Limitation of the Study 180
5.3 Recommendation 183

REFERENCES 186
APPENDICES 203
BIODATA OF THE AUTHOR 269
# LIST OF TABLE

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Glossary of terms</td>
<td>13</td>
</tr>
<tr>
<td>3.1</td>
<td>Parameters used for sample size calculation</td>
<td>69</td>
</tr>
<tr>
<td>3.2</td>
<td>Inclusion and exclusion criteria of subject selection</td>
<td>72</td>
</tr>
<tr>
<td>3.3</td>
<td>Overview of the implementation of intervention in the exercise group</td>
<td>92</td>
</tr>
<tr>
<td>3.4</td>
<td>Overview of the implementation of intervention in the diet group</td>
<td>93</td>
</tr>
<tr>
<td>3.5</td>
<td>Overview of the implementation of intervention in the diet + exercise group</td>
<td>94</td>
</tr>
<tr>
<td>4.1</td>
<td>Socio-demographic characteristics at baseline</td>
<td>97</td>
</tr>
<tr>
<td>4.2</td>
<td>Anthropometric measurements of the participants at baseline</td>
<td>98</td>
</tr>
<tr>
<td>4.3</td>
<td>Biochemical measurements of the participants at baseline</td>
<td>103</td>
</tr>
<tr>
<td>4.4</td>
<td>Dyslipidemia and elevated FBS at baseline</td>
<td>104</td>
</tr>
<tr>
<td>4.5</td>
<td>Blood pressure and distribution of participants according to hypertension</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>At baseline</td>
<td></td>
</tr>
<tr>
<td>4.6</td>
<td>Macronutrient intake at baseline</td>
<td>110</td>
</tr>
<tr>
<td>4.7</td>
<td>Mean percentages of energy from macronutrients at baseline</td>
<td>113</td>
</tr>
<tr>
<td>4.8</td>
<td>Micronutrients intakes at baseline</td>
<td>115</td>
</tr>
<tr>
<td>4.9</td>
<td>Distribution of participants according to dietary risk factors at baseline</td>
<td>116</td>
</tr>
<tr>
<td>4.10</td>
<td>Food frequency mean scores of participants at baseline</td>
<td>117</td>
</tr>
<tr>
<td>4.11</td>
<td>Energy expenditure (MET- minutes/week) at baseline</td>
<td>118</td>
</tr>
<tr>
<td>4.12</td>
<td>Knowledge and beliefs mean scores of participants based on the Health</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>Belief Model at baseline</td>
<td></td>
</tr>
<tr>
<td>4.13</td>
<td>Mean anthropometric measurements at baseline, after intervention</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>and average change over the intervention period</td>
<td></td>
</tr>
</tbody>
</table>
4.14 Prevalence of obesity based on BMI, waist circumference and WHR
At baseline, after intervention and the change over the intervention period

4.15 Mean biochemical measurements at baseline, after intervention and average
change over the intervention period

4.16(a) Distribution of participants with dyslipidemia and elevated FBS at
Baseline, after intervention and change over the intervention period

4.16(b) Distribution of participants with dyslipidemia and elevated FBS at
Baseline, after intervention and change over the intervention period

4.17 Blood pressure measurements (mean) at baseline, after intervention and the
average change over the intervention period

4.18 Distribution of participants according to hypertension at baseline, after
intervention and change over the intervention period

4.19 Distribution of participants according to hypertension at baseline
After intervention and change over the intervention period

4.19(a) Macronutrient intake (mean) at baseline, after intervention and the mean
Change over the intervention period

4.19(b) Macronutrient intake (mean) at baseline, after intervention and the mean
Change over the intervention period

4.20 Percentages of energy from macronutrients at baseline, after intervention
And change over the intervention period

4.21 Micronutrient intake (mean) at baseline, after intervention and the change
Over the intervention period

4.22 Food frequency means scores of participants after intervention

4.23 Energy expenditure (MET-minutes/week) at baseline, after intervention
And the mean change over the intervention period

4.24 Distribution of participants according to physical activity level at baseline
And after intervention

4.25 Health Belief components (mean) at baseline, after intervention and the
Mean change over the intervention period

4.26 Distribution of participants according to dietary risk factors for CVD at
Baseline, after intervention and change over the intervention period

xviii
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Conceptual framework of the study</td>
<td>8</td>
</tr>
<tr>
<td>2.1</td>
<td>Deaths by cause, all ages in the Islamic Republic of Iran, 2002</td>
<td>25</td>
</tr>
<tr>
<td>2.2</td>
<td>Projected prevalence of overweight, the Islamic Republic of Iran, males and females aged 30 years or more, 2005 and 2015</td>
<td>29</td>
</tr>
<tr>
<td>2.3</td>
<td>Mean of blood pressure(mmHg) in the Islamic Republic of Iran</td>
<td>38</td>
</tr>
<tr>
<td>2.4</td>
<td>Cardiovascular mortality rate in women in the United States</td>
<td>42</td>
</tr>
<tr>
<td>2.5</td>
<td>Physical inactivity in Iran by age group</td>
<td>43</td>
</tr>
<tr>
<td>2.6</td>
<td>Conceptual framework of the Health Belief Model</td>
<td>51</td>
</tr>
<tr>
<td>3.1</td>
<td>Location of the study</td>
<td>68</td>
</tr>
<tr>
<td>3.2</td>
<td>Study Design</td>
<td>71</td>
</tr>
<tr>
<td>3.3</td>
<td>Recruitment and retention of participants in the study</td>
<td>74</td>
</tr>
<tr>
<td>4.1</td>
<td>Distribution of the participants according to BMI categories at baseline</td>
<td>99</td>
</tr>
<tr>
<td>4.2</td>
<td>Distribution of the participants by waist circumference categories at baseline</td>
<td>100</td>
</tr>
<tr>
<td>4.3</td>
<td>Distribution of the participants according to WHR categories at baseline</td>
<td>101</td>
</tr>
<tr>
<td>4.4</td>
<td>Distribution of the participants according to the levels of physical activity at baseline</td>
<td>119</td>
</tr>
</tbody>
</table>
1.1 Background

Menopause is a natural event in the aging process and with the cessation of cyclic ovarian function manifested by cyclic menstruation signifies the end of a woman’s reproductive years. The average age of menopause is 51 years, and less than 1% of women experience it before the age of 40, while some women undergoing premature menopause (surgery or chemotherapy) at a very early age (Burger et al., 2002). The hormonal changes associated with menopause, for example, low plasma levels of estrogen and marked increase in leutenizing hormone (LH) and follicle stimulating hormone (FSH) levels, exert significant effects on the metabolism of plasma lipids and lipoproteins (Sacks et al., 1992). Unfortunately, menopause is not just a time of dramatic hormonal changes, but, more often, social and psychological changes accompany menopause.

In 1960, the world population of women above 60 was less than 250 million, but it is estimated that by 2030, 1.2 billion women will be peri- or postmenopausal, as a result of an increase by an average of 4.7 million a year (Yong & Chang, 2003). It is also estimated that in developed countries, women now aged 50 can be expected to live for a further 30 years. The population of older than 60 years in Iran has also increased, due to higher life expectancy (Massarrat et al., 2002). The World Health Organization (WHO, 2006) estimated that the population of women in Iran is 34,900,000 out of total population 70,300,000, and 14% were above 50 years. Because of these projected
changes in population structure, physicians are beginning to view menopause not as a negligible natural phenomenon but as a major public health problem (Yong & Chang, 2003).

Median age of menopause has been found to be 49.9, 49.2, and 49.6 years in urban, rural, and total population of Iran, respectively. Meanwhile, the mean age at menopause in the total population in most countries is 50.4 years (S.D. =4.3) (Hashemi et al., 2004). Women experience numerous changes after menopause, and about 51% of women face excessive medical problems with these changes. Among these changes, osteoporosis and heart disease are responsible for most problems in menopause women.

The other major complication in menopausal women is cardiovascular disease (CVD). Globally, CVD is the number one cause of death and is projected to remain so in the future. An estimated 17.5 million people died from CVD in 2005 alone, representing 30% of all global deaths. Around 80% of these deaths occurred in low and middle-income countries (WHO, 2007). In countries of the Eastern Mediterranean Region (including Iran), increasing economic wealth along with rapid population growth have led to an increasing mortality rate from CVD (Fakhrzadeh et al., 2008). According to the latest data from Iran, death rate of females due to CVD was 144 per 100,000 in 2002 (WHO, 2006).

It is well known that the main cause for heart disease is lipid disorders or dyslipidemia. Part of the reasons why menopausal women are susceptible to CVD is in fact that lipid metabolism rapidly deteriorates in women when they reach menopause. Hyperlipidemia
and coronary heart disease rises in women of menopausal age, due to decrease in estrogen, which has the action of controlling low density lipoprotein (LDL) production, increasing high density lipoprotein (HDL) production and anti oxidation (Sugiura et al., 2002). It is, therefore, not surprising that the main cause of death in developed and developing countries is CVD.

Some risk factors for CVD, like age, sex and heredity, are unmodifiable. However, other factors can be modified by changing lifestyles. Lifestyle consists of a broad range of whole human activities, such as diet, physical activity, smoking and weight loss. Therefore, in menopausal women, the key factor for reducing risk to CVD is lifestyle change. In the present study, the researcher intends to study the effect of lifestyle changes (physical activity and diet intervention) on CVD risk factors.

1.2 Problem Statement
In 2005, CVD was the world's leading cause of death accounting for 28% of all deaths worldwide, with 80% of the burden experienced by low- and middle-income countries (Abegunde, 2007). It is predicted that the leading cause of death in the world in 2030 will be ischemic heart disease (WHO, 2008). On the other hand, at least 20 million people survive heart attacks and strokes every year, with a significant proportion of them requiring costly clinical care, which puts a huge burden on long-term care resources. CVD affects people in their mid-life years undermining the socioeconomic development. In other words, it does not only affect individuals but families and nations as well. Lower socioeconomic groups generally have a greater prevalence of risk factors to
diseases and mortality in developed countries, and as the CVD epidemic matures in developing countries, it will only add on to the mortality and morbidity risk factors in these countries, many of whom can ill afford to cope with additional financial burden (WHO, 2006).

In the 1970s, the most important causes for death in the Islamic republic of Iran were infectious disease with 94 deaths per 100,000, followed by diarrhea and diarrhea plus gastrointestinal disease which were responsible for 46 deaths per 100,000. The cardiovascular disease with 42 deaths per 100,000 was the third major cause of death. Thirty-two years later, in 2002, cardiovascular disease became the most important cause of death in Iran with a rate of 167.7 deaths per 100,000 people, with an estimated 23.4% wasted age (years which everybody can survive with disability), and, in the same year, 38% of all deaths were due to CVD. The mean age of death due to cardiovascular disease in Iran was 68 years (Ministry of Health and Medical Education, Iran, 2006).

The major non-modifiable risk factors for CVD consist of increasing age, gender and heredity factors including race. Major modifiable risk factors for CVD are smoking, high blood cholesterol, high blood pressure, physical inactivity, obesity, diabetes type 2 and stress (Purcell et al. 2006). Among Iranians the most important risk factors for CVD were identified as sedentary lifestyle (69%), high level of cholesterol (44%) and being overweight (28%) (Ministry of the Health, Iran, 2005).

Menopausal women are at a greater risk of CVD. The effects of menopause transition on metabolic and cardiovascular disease risk in women are unclear. It is unknown whether
estrogen deficiency, aging, or a combination of both factors contributes to a worsening health profile in women. Preliminary evidence suggests that natural menopause is associated with reduced energy expenditure during rest and physical activity, an accelerated loss of fat-free mass, and increased central adiposity and fasting insulin levels (Poehlman, 2002).

Healthy lifestyle is an important strategy for the whole community, and it revolves around a balanced diet, avoiding saturated fats, taking regular exercise, reducing weight and not smoking. Numerous studies in people with and without documented CVD have revealed that a low level of aerobic fitness is an independent risk factor for all-cause and cardiovascular mortality (Haddock et al., 2000). Regular exercise also promotes reductions of body weight and fat stores, blood pressure (particularly in hypertensive patients), levels of total blood cholesterol, serum triglycerides, and low-density lipoprotein cholesterol. Exercise also increases high-density lipoprotein cholesterol, and it may also reduce the risk of CVD by improving blood hemostatic function (Eichner, 1997). Currently it is estimated that, 60% of the world's population do not get enough physical activity to achieve even this modest recommendation (30 to 60 minutes three or four times a week), with adults in developed countries most likely to be inactive (Franklin & Sanders, 2000). The risk of developing cardiovascular disease increases by 1.5 times in people who do not follow minimum physical activity recommendations (WHO, 2006).

Education (conducted based on a standard schedule) and counseling can change behavior. Several models of health education, for example, the Health Belief Model
(HBM), Cognitive and Information Processing Model, Theory of Reasoned Action (TRA) and Social Cognitive Theory (SCT) have been used in studies. In the past ten to fifteen years, a number of conceptual models have been proposed in an attempt to explain these individual health-related behaviors. Among these theories, the model that has received the most direct attention and has influenced much research is the “Health Belief Model” (Becher et al., 1977).

The Health Belief Model (HBM) posits that health behavior is a function of the perceptions an individual has of vulnerability to an illness and the perceived potential effectiveness of treatment with respect to deciding whether to seek medical attention. In this model, health-related behaviors are determined by whether individuals: (1) perceive themselves to be susceptible to a particular health problem; (2) see this problem as serious; (3) are convinced that treatment or prevention activities are effective and (4) are exposed to a cue to take a health action (Elder et al., 1999).

Due to improvements in health and nutritional status, as well as medical care in Iran, life expectancy among women has increased to 71 years in the year 2000 (UNFPA, 2000). Therefore, with increasing the number of women who become menopause annually, and since there are some physical and psychological problems associated with menopause, studying menopause complications and ways to overcome these complications in Iran is necessary.

Because CVD is the most important cause of death in Iran, and the important risk factors for CVD are physical inactivity, high cholesterol and overweight, in the present study,
the researcher intends to examine the effect of behavior changes (diet intervention and exercise) on cardiovascular risk factors in postmenopausal women.

1.3 Conceptual Framework of the Study

The basic premise of the framework (Figure 1.1) was the fact that during menopause, women go through several changes; namely, reduction and therefore a lack of estrogen, reduction in energy expenditure due to lack of estrogen, physical inactivity and may have unhealthy diets all of which were reflected in increased lipid profiles (box on the far left). This put them at risk of contracting CVD. CVD risk factors included obesity, dyslipidemia, hypertension, physical inactivity and inappropriate dietary intake (right hand box). This study introduced an educational intervention program in order to determine its effectiveness. The study divided the participants into three intervention groups (exercise, diet and diet + exercise) and then determined the effects of six months educational intervention on CVD risk factors were compared with a control group. The box at the base of the framework spells out the changes that are expected as a result of intervention. These include: a) biochemical changes i.e. reductions in cholesterol, TG, FBS, LDL, VLDL CRP, increase in HDL, b) anthropometric changes like BMI, waist circumference and WHR, c) increased physical activity, d) reduction in blood pressure, and e) improved dietary intake.
Figure 1.1: Conceptual Framework of the Study
1.4 Importance of the Study

The burden of CVD is increasing worldwide. Between 2002 and 2006, CVD has been cited as the most important cause of death in Iran. The important modifiable risk factors for CVD in Iran are physical inactivity, high cholesterol and being overweight. Nutrition and dietary pattern has been known for many years to be modifiable risk factor for chronic diseases especially CVD. Currently, interest in physical activity as a means for primary prevention of CVD is increasing as the evidence of its protective role has become more definitive. As the diet and physical activity are the most important aspects of lifestyle for CVD prevention, this intervention has been developed to help women change their dietary habits and sedentary lifestyle.

A salient characteristic of this study is that women will be encouraged to adopt healthy diet patterns without having to make drastic diet changes (e.g. low fat or high protein, low carbohydrate diet).

In Iran, there are not many diet and exercise intervention programs to reduce CVD risk factors, especially among women. Therefore this study can be starting point for menopausal women to adjust their lifestyle in order to cater to major health problems e.g. CVD that they experience in menopause.

Therefore, this study is essential to support the importance of healthy diet and physical activity as the primary prevention strategies for CVD. The findings and knowledge derived from this study will be useful for the future development of diet and physical activity programs in the society. At the present time, there is no special service devoted
to postmenopausal women. It is also hoped that the result of this study can influence the policy makers in Iran to pay special attention to the health needs of postmenopausal women and, therefore, provide the appropriate health programs.

1.5 Objectives of the Study

Main objective:

The main objective of this study is to determine the effect of exercise and diet educational intervention on modifiable CVD risk factors among postmenopausal Iranian women.

Specific Objectives:

1- To determine the CVD risk factors in postmenopausal women:

i. Anthropometric measurements including; body mass index (BMI), waist circumference, waist hip ratio (WHR)

ii. Lipid profile including; cholesterol, low desity lipoprotein (LDL), very low desity lipoprotein (VLDL), high density lipoprotein (HDL), triglyceride (TG) and C-reactive protein (CRP)

iii. Fasting blood sugar (FBS)

iv. Blood pressure

v. Physical activity

vi. Diet
2- To determine the effects of exercise and diet educational intervention on CVD risk factors:
   i. Anthropometric measurements (BMI, waist circumference, WHR)
   ii. Lipid profile (cholesterol, LDL, VLDL, HDL, TG and CRP)
   iii. FBS
   iv. Blood pressure
   v. Physical activity
   vi. Diet

3- To examine the components of the Health Belief Model at baseline and at the end of the interventions with regards to:
   i. Level of knowledge of women about the effect of exercise and diet on CVD risk factors
   ii. Perception of postmenopausal women about the seriousness of CVD
   iii. Perception of postmenopausal women about the barriers and benefits of exercise and healthy diet on CVD risk factors
   iv. Perception of postmenopausal women about vulnerability to CVD
   iv. Perception of postmenopausal women about cues to action to reduce CVD risk factors

4- To examine the relationship of Health Belief Model and reduction in CVD risk factors
1.6 Null Hypotheses

At the end of the study, there is no significant difference in changes among groups before and after the intervention in the following areas:

1- CVD risk Factors

   i. Anthropometric measurements (BMI, waist circumference, WHR)
   ii. Lipid profile (cholesterol, LDL, VLDL, HDL, TG and CRP)
   iii. FBS
   iv. Blood pressure
   v. Physical activity
   vi. Diet

2- Components of the Health Belief Model

   i. The level of knowledge
   ii. The perception of the seriousness of CVD
   iii. The perception of the benefits of intervention for CVD prevention
   iv. The perception of the vulnerability to CVD
   v. The perception of cues to action for CVD
   vi. The perception of barriers towards CVD prevention

3- There is no significant relationship between Health Belief Model and reduction in CVD risk factors
<table>
<thead>
<tr>
<th>Terms</th>
<th>Definition</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td>Health Belief Model (HBM)</td>
<td>The HBM is an educational model for prevention-focused programs as these programs generally promote specific actions, and the HBM helps participants to take action.</td>
<td>Glanz, Lewia &amp; Rimer. (1997)</td>
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<td>Health enhancing physical activity (HEPA)</td>
<td>An active category that computed for people who being active at least 1.5 to 2 hours throughout the day, which accumulate a minimum of at least 3000 MET-minutes/week</td>
<td>IPAQ Group, (2004)</td>
</tr>
<tr>
<td>METs</td>
<td>Metabolic Equivalents, multiple of the resting rates of oxygen consumption during physical activity</td>
<td>Ainsworth et al., 1993</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Any body movement produced by skeletal muscles and resulting in a substantial increase over the resting energy expenditure</td>
<td>American Heart Association, (2001)</td>
</tr>
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</table>
Cardiovascular disease (CVD) is defined as a disease in heart or blood vessel and stroke.

CVD risk factors include: Heredity, being male, advancing age, cigarette smoking, high blood pressure, diabetes, obesity, lack of physical activity, (abnormal blood cholesterol and homocysteine levels).

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