

## Review Article



# The Status, Policies, and Programs of Preconception Risk Assessment in Iran: A Narrative Review

Fatemeh Ghaffari Sardasht<sup>1</sup>, Zahra Motaghi<sup>2</sup>, Mohammad Shariati<sup>3</sup>, Afsaneh Keramat<sup>4</sup>, Nahid Akbari<sup>5</sup>

<sup>1</sup>Department of Reproductive Health, Student Research Committee, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>2</sup>Department of Midwifery and Reproductive Health, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>3</sup>Department of Community Medicine, Tehran University of Medical Sciences, Tehran, Iran

<sup>4</sup>Department of Reproductive Health, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran

<sup>5</sup>Department of Midwifery and Reproductive Health, School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran

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### \*Corresponding Author:

Fatemeh Ghaffari Sardasht,  
Email: ghaffarif891@gmail.com

## Abstract

**Introduction:** Preconception care is defined as a set of interventions that aim to identify and modify biomedical, behavioral, and social risks to a woman's health or pregnancy outcome through risk assessment, health promotion, and medical and psychosocial interventions. This study aimed to review the status, policies, and programs of preconception risk assessment in Iran.

**Methods:** We searched scientific databases including Medline, PubMed, Web of Science, Scopus, CINAHL, Magiran, Iran Medex, SID, Iran Doc, Science Direct, and Google Scholar using key words such as "preconception care", "pre-pregnancy care", "instruction", "guideline", "risk assessment", "program", "policy", "Iran" and their combinations. No time limit was considered in searching the databases and all studies were published until February 1, 2020. Our search strategy resulted in the retrieval of 66 articles and guidelines, of which nine articles met the inclusion criteria and entered the study.

**Results:** Multiple guidelines have been designed to assess the general health of women and men of childbearing age, with pay little attention to the reproductive health assessment in Iran. Assessment of reproductive health is specific to the integrated maternal health care program, which the reproductive health risk assessment from pre-pregnancy to postpartum period. The preconception care is a component of integrated maternal health care program that is faced in its content and faces challenges in implementation.

**Conclusion:** Several strategies have been developed in the field of risk assessment for general health in Iran, but risk assessment in pre-pregnancy period is only exclusive to preconception care program that is moderate in performance.

## Introduction

A healthy mother and a healthy child are the hopes and aspirations of all cultures and ethnicities all around the world.<sup>1</sup> Preconception care has been formally launched for the same purpose since 1980,<sup>2</sup> and it is a set of complex preventive and therapeutic interventions to identify and mitigate biomedical, behavioral, and social risks threatening women's health or pregnancy outcome.<sup>3</sup> As a preconception risk assessment system, these cares are increasingly popular both domestically and internationally as an important prevention strategy to improve outcomes for women and infants. Preconception care has three general parts including risk assessment, intervention, and health promotion.<sup>4,5</sup> Risk assessment is the scientific evaluation of the known or potential harmful effects of

human exposure to hazards.<sup>5</sup> In general, risk assessment should include general health assessment; moreover, it should consider medical, surgical, behavioral, social, drug, occupational, and educational risk assessment, as well as other barriers that pose risks to fertility and pregnancy.<sup>6</sup>

Initially, preconception care was provided only to women who experienced one or more types of complications during pregnancy and their previous pregnancies; but today these care services are considered as part of the care chain and are offered to the women of reproductive age as part of primary healthcare. Recently, the area of preconception care has expanded to include men's care. However, intervention and reducing women's health risks are central to preconception care.<sup>7</sup>

Studies have shown that mothers often become aware of

their pregnancy when the sensitive stage of organogenesis has started or ended. Therefore, preconception care is like the hope that mothers, with the help of physicians, can resolve or modify the issues that require special care before they become pregnant.<sup>8</sup>

According to the Centers for Disease Control and Prevention (CDC), 30% of United States mothers have at least one risk factor for pregnancy that can be identified before pregnancy,<sup>9</sup> as well as a relatively wide range of women in developing countries, i.e., more than one quarter of all women of reproductive age suffer from acute or chronic illnesses and injuries associated with pregnancy and childbirth. Women with chronic diseases such as diabetes, hypertension, heart disease, etc. are among the high-risk groups during pregnancy, which can lead to irreparable damages and injuries due to lack of timely diagnosis and assessment and ignoring them in healthcare.<sup>10</sup>

Maternal malnutrition and iron deficiency increase the risk of maternal death worldwide by at least 20%. Two-fifths of women also become unintentionally pregnant; as a result, 40% of couples decide to have a baby when it is too late to intervene. Also, *Neisseria gonorrhoeae* had a prevalence of 1.3% in the pregnant women, which results in low birth weight and preterm delivery, and more than 10% lead to prenatal death.<sup>5</sup> According to several studies in Iran, the prevalence of gestational diabetes was 3.41%,<sup>11</sup> metabolic syndrome was 36%,<sup>12</sup> obesity in women over 18 years was 14%,<sup>13</sup> and preterm delivery cases was 9.2%.<sup>14</sup> Although some studies reported preeclampsia in Iran as 4%, the accurate statistics by the World Health Organization (WHO) was 7%-8%.<sup>15</sup> Azami et al reported anemia prevalence in women of Iranian rural areas as 17.6% and urban areas as 22.1%.<sup>16</sup> Therefore, the early effects of these diseases on pregnancy outcome should be diagnosed and controlled before pregnancy.<sup>17</sup> Proper counseling and medical evaluation before pregnancy is a component of cares in the pre-pregnancy period and one of the aspects of preventive medicine. A good consultation on changing women's lifestyle and behavior, such as changes in diet, no smoking, no alcohol consumption, etc. can reduce pregnancy complications, fetal abnormalities, neonatal complications, and cesarean delivery; and as a result, it can have a significant impact on improving pregnancy outcomes. The importance of counseling in the prevention of maternal and neonatal complications is to such an extent that in some cases, unsuccessful pregnancy outcomes are attributed to a lack of counseling and preconception care despite providing good quality prenatal care.<sup>18</sup> Preconception care is a transition from critical care in the period of pregnancy to preventive care based on preconception counseling.<sup>5</sup> Considering the new aspects that confirm the importance of these care and various benefits mentioned in numerous studies, and since there is no study to investigate the preconception risk assessment in Iran, this study aimed to review the status,

policies, and programs of preconception risk assessment in Iran.

## Materials and Methods

This narrative review searched databases including Magiran, Iran Medex, Iran Doc, Scopus, Medline, PubMed, Science Direct, Google Scholar, Scientific Information Database (SID) and Web of Science using such keywords as "preconception care", "pre-pregnancy care", "instruction or guideline", "preconception period", "pre-pregnancy period", "risk assessment", "program", "policy", "Iran" and their combinations. Cross-sectional studies published until November 22, 2019 were considered. In this study, articles published in English and Persian languages were reviewed. The full-texts of all citations that were likely to meet the objective of our study were obtained. In duplicate cases, the most recent and complete versions were selected. Articles with no clear methodology were excluded. Also, the authors included existing guidelines and instructions published by the Ministry of Health and Medical Education (MOHME) on preconception risk assessment and relevant papers published in Persian or English languages in Iran. Other inclusion criteria included articles indexed in authoritative databases, being Iranian authors, and being affiliated to one of Iran's scientific centers. The researchers excluded letter-to-editor and conference papers. Other exclusion criteria were poor quality, duplication, inadequate data on studies, and inaccessibility to the full-texts of relevant articles. The procedure consisted of one researcher searching for the guidelines and articles. Initially, the titles and abstracts of the articles were reviewed so as to apply the inclusion and exclusion criteria. Then, the full-texts of the qualified articles were obtained and results were extracted. The results were given to two other researchers for revision and correction.

## Results

In the initial search, 66 articles and guidelines were retrieved. After reviewing the abstracts, nine studies<sup>19-27</sup> met the inclusion criteria and were included in the study (Figure 1).

Table 1 provide an overview of the characteristics of the included studies. Two studies used observational questionnaire and other two studies used the self-administered questionnaire. The results showed today, the country's health system is responsible for improving the quality of life and health of people from safe delivery of a healthy baby to maternal care during pregnancy or recognizing risk factors for diseases in the coming years of a person's life.

Health systems have a vital and continuous responsibility to all individuals in a community throughout their lives, and these health systems are essential for the healthy growth of individuals and communities all over the world.

Since maternal health is one of the main components in

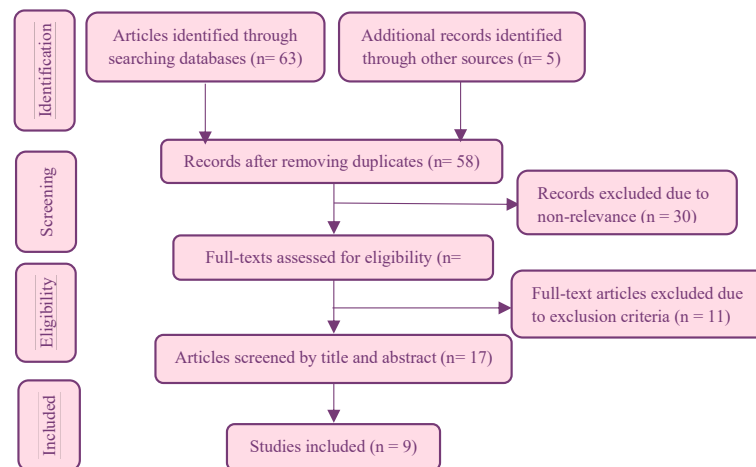


Figure 1. Flowchart of the study

the primary health care system in Iran, extensive measures have been taken to assess the risk, intervention, and health promotion of girls and women of childbearing age, which are described below.

### **National Action Plan for Preconception Risk Assessment Providing Care According to Age Groups**

Assessment guidelines and national instructions show that health services packages have been developed for adolescent, young, and middle-aged groups, whereby men and women of reproductive age are assessed for risk and necessary cares. Cares are formulated separately based on age group and there is special care in every age group. For example, visual and auditory evaluation, height status, and puberty examination process are specific to the age group of 6-18 years. In the age group of 18 to 29 years, sexually transmitted infections (STIs), non-communicable diseases (NCDs), and pelvic and vaginal infections have been added. The middle-aged groups are evaluated for cancer and menopause. Some other cases such as assessing a woman's illness history and family background, nutrition status, and physical activity are the same for all age groups. The content of risk assessment in health packages is as follows:

The health package for the age group of 6-18 years includes vaccination status, vision and hearing status, height and body mass index (BMI) status, nutritional pattern, mental health assessment, social health care (such as child abuse or school dropout), tobacco use and drug abuse, emergencies (such as fractures and burns), skin and hair evaluation, asthma, tuberculosis, and hypertension.<sup>28</sup>

The health package for youth age group is designed to serve men and women aged 18-29 years. The risk assessment in this health package includes the following: nutritional status (dietary and nutritional examination, BMI, cardiovascular assessment), genetic counseling, vaccination status, oral examination, infectious diseases such as tuberculosis, mental health assessment, and drug abuse screening.<sup>29</sup>

The same package is true for middle-aged group.

This package is designed to serve men and women aged 30-59. This risk assessment service package includes assessment and management of individual risk factors, anthropometric and physical activity, mental health status, drug abuse, vaccination status, individual risk factors (including nutritional risk factors, NCDs, and taking action to prevent and control them), occupational exposure, prevention and treatment of diseases of the urogenital system, prevention and early detection of skin cancer, colorectal and prostate cancer screening, and prevention and early detection of breast and cervical cancers.<sup>30</sup>

### **Genetic Counseling**

One of the risk assessment cases that is briefly mentioned in these health packages is genetic counseling. The overall goal of the MOHME for genetic counseling is to control and prevent hereditary-genetic diseases and congenital malformations. Accordingly, three general strategies have been considered as follows: providing genetic counseling and genetic services during marriage and preconception period, providing genetic services in the form of age-group health packages, and screening for familial risk factors in NCDs.<sup>31</sup>

### **Genetic Counseling for Young Couples During Marriage and Preconception Period**

In premarital counseling phase, females are evaluated for drug abuse before marriage and males are examined for several blood diseases, including hepatitis, thalassemia, and syphilis. If there is a problem with the couple's blood sample, re-testing couples or referring them for special genetic testing and pre-marriage genetic counseling are recommended, especially in consanguineous marriage. The integration of the Beta Thalassemia Major Prevention Program is an example of integrating genetic services into the health system, that like any other genetic program, requires basic tools to be presented at the community level.<sup>32</sup>

The national thalassemia carriers screening laboratories

**Table 1.** Characteristics of studies on preconception care in Iran

Author (Year)	Article Title	Study Design	Location	Study Population	Results
Nekuei et al <sup>19</sup>	Preconception consultation in women undergoing infertility treatment	Descriptive cross-sectional	Isfahan	268 men and women admitted to infertility clinic in Isfahan for treatment of infertility	Lack of counseling regarding lifestyle (76%), nutrition counseling (70%), sexual health (90%), mental aspects of infertility (90%).
Nekuei et al <sup>20</sup>	Preconception risk assessment in infertile couples	Descriptive cross-sectional	Isfahan	268 men and women admitted to infertility clinic in Isfahan for treatment of infertility	Only 3% of were physically examined and 4% were asked for individual history, but genital examination and question about history of menstruation were performed in 100 cases.
Nekuei et al <sup>21</sup>	Preconception intervention in infertile couples	Descriptive cross-sectional	Isfahan	268 men and women admitted to infertility clinic in Isfahan for treatment of infertility	The intervention for treatment of the disease was performed completely in 47% of cases and folic acid administration was complete in 79.9% of cases. But referral to genetic counseling was not done in 98.9% of cases.
Ahmadinezhad et al <sup>22</sup>	Preconception care compliance with national standards at Ahwaz Health Centers	Descriptive cross-sectional	Ahwaz	358 women of reproductive age admitted to health centers for preconception care	Preconception care was moderate in most of the wards studied.
Jahani Shourab et al <sup>23</sup>	Study of preconception care process based on Donbedian model in Mashhad Health Centers	Descriptive cross-sectional	Mashhad	320 women of reproductive age admitted to health centers in Mashhad for preconception care	In 93% of cases, the process of preconception care was moderate.
Kamalifard et al <sup>24</sup>	Scope of preconception cares offered in Tabriz health centers based on women's views	Descriptive cross-sectional	Tabriz	384 pregnant women admitted to health centers who were in the first half of pregnancy at the time of the study	The scope of pre-pregnancy care in the area of physical health was either weak (75%) or average (25%). All women declared that they had not received mental health-related care during the pre-pregnancy care.
Latifnejad Roudsari et al <sup>25</sup>	Patterns and factors affecting preconception health behaviors in Iranian women	Descriptive cross-sectional	Mashhad	480 married women having health records in health centers of Mashhad and were planning to become pregnant	Only 37% of women consumed folic acid correctly; 33% had oral and dental examination, and 33% had paraclinical examinations.
Bayrami et al <sup>26</sup>	Survey of women's lifestyle during preconception in Kalat City	Descriptive cross-sectional	Kalat	118 married women who did not use any contraceptive methods and intended to become pregnant and had a health record in the Kalat health centers	More than half of the women in the study did not receive preconception counseling; only 33% of those who received this consultation used folic acid.
Shirmohammadi et al <sup>27</sup>	Preconception cares in abortion treatment applicants	Descriptive cross-sectional	Isfahan	200 women of reproductive age	48% of applicants with abortion and maternal problems had not received preconception care.

have been established as a network since 1999. The main task of this network is to perform genetic tests and diagnose thalassemia before birth. The network accepts referrals from genetic counselors working at specific genetic counseling centers and gives them the feedback.<sup>33</sup> The premarital counseling programs were organized in 2017 and communicated to all Iranian universities, as well as medical universities all over the country. In this regard, it is planned that by the end of the National Sixth Development Plan, the country will achieve the goal set in the Health Transformation Plan and the Operational Plan of the Universities of Medical Sciences based on a 50% reduction in genetic diseases. The strategies in this regard include screening for thalassemia in engaged couples, screening the parents of patients with major thalassemia to identify couples eligible for special genetic care, and thalassemia screening in couples who have not done thalassemia tests before marriage for any reason (including non-initiation of thalassemia screening in the area, unregistered contracts, some specific social groups, immigrants, foreigners residing in the country, etc) and are currently pregnant.<sup>32</sup>

### *Integration of Genetic Services Into Health Packages for Age Groups*

Healthcare providers in urban and rural comprehensive health centers identify genetic risk factors and family risk factors for NCDs in different age groups and refer them to a general physician. Providing health services according to different age groups results in integrated services for each of the major age groups throughout their lives.

### *Screening for Familial Risk Factors in the Population*

Reducing the risk in multifactorial diseases is possible by avoiding environmental risk factors early in childhood, and it does not have the necessary impact on prevention in adulthood. In addition, people with genetic risk factors develop the disease earlier and more severely. Prevention and control of NCDs, especially common diseases, such as cardiovascular disease, diabetes, and cancer, are at top priority of Iran's health system.<sup>31</sup>

### *Surveillance of STIs*

Although some STIs are treatable, untreatable ones, such as the herpes virus, impose a high burden on all



community members in terms of morbidity and mortality. The presence of untreated inflammation and STIs with injuries increase the likelihood of transmission of HIV infection through sexual contact, while the development of prevention and control programs for this infection has a significant impact on the control and prevention of STIs. In this regard, four strategies for STIs including training and informing, prevention of sexual transmission, care, and treatment, strengthening epidemiological surveillance system, and data management and analysis have been discussed and emphasized in the fourth national AIDS and transmitted diseases control program in Iran (1984-2014).

HIV testing and counseling is currently performed in all Iranian health and behavioral counseling centers. These centers provide all preventive services, HIV care and treatment services (especially HIV vaccination and treatment), harm reduction services (syringes and needles, condoms), trainings, and testing in a completely confidential and voluntary way, and free for those who are exposed to risks. In these centers, trained physicians and counselors are present and telephone and in-person counseling is possible. On the other hand, the introduction of the rapid diagnosis test in 2011 resulted in rapid development of diagnostic centers. The centers using rapid HIV testing are different, including all behavioral disease counseling centers, some prenatal care clinics, health centers, many drop in center, homeless service, vulnerable women's centers, many prisons, some addiction treatment clinics, tuberculosis treatment centers, some selected hospitals, and some private offices.<sup>34</sup>

#### ***National Maternal Mortality Surveillance System in Iran***

The National Maternal Mortality Surveillance System is a risk assessment system that retrospectively examines pregnancy risk factors in deceased women due to pregnancy and childbirth complications. This system was first established in 1995 to identify effective factors in maternal and neonatal mortality and to design appropriate interventions, the State Committee for Maternal and Neonatal Mortality, and academic and city committees.

Due to the importance of maternal death and its effect on family and community health and its role as one of the important indicators since the beginning of 2000, the "National Maternal Mortality Surveillance" was designed after reviewing global experiences, existing scientific recommendations, and guidelines of the WHO.

Evaluation of data from completed questionnaires and workflows in 1999 showed that the existing system needs to be revised. In order to resolve this problem, the design of the National Maternal Mortality Surveillance System was started in early 2000 and after reviewing the world experiences and existing scientific recommendations by the WHO, the related tools and workflow were codified. Then, the final system and its formal implementation began throughout the country in early 2001 through

numerous meetings and surveys of university officials and experts.<sup>35</sup>

#### ***Integrated Health System (SIB)***

When this system is launched to provide health services in the context of health system transformation plans and programs, all information on households, types of healthcare needed in community health centers, bases, and homes will be entered and recorded. This system has been in operation since the beginning of October 2015 and has made general changes in the implementation of the maternal health plan. The following data can be obtained through using the SIB system: statistics and information about preconception care, pregnancy care, postpartum care, pregnant mothers intensive care, postpartum intensive care, thromboembolism screening, congenital malformation screening, and mental screening.

The SIB is a national program which records patient information; it helps the healthcare provider and physician to make a better diagnosis and ensure that the patient's history is accurate and reliable. Statistics and information that can be downloaded from the SIB system include the following: number of preconception care mothers, number of pregnant care mothers, high-risk pregnant mothers, number of childbirth care mothers, percentage of pregnant women receiving preconception care, etc.<sup>36</sup>

#### ***Risk Assessment in Preconception Care***

Preconception care, which was part of the integrated maternal healthcare program from the beginning, was formulated from 2000 to 2002 and expanded throughout the country after a trial and evaluation in 2006. Currently, preconception care, in the form of a reproductive health program, electronically assesses the risk of the preconception period. The program is running electronically in the SIB System, which is the most comprehensive electronic health record (EHR) system and has been provided to be used for all persons around the world. The most important characteristics of the SIB include mass production and complex and rapid data and information generating. It includes a wide range of personal demographic information, records of diseases, medical records, and all information affecting individual health. Also, there is the possibility of interaction with other systems out of the MOHME, such as insurance system, forensic medicine, etc.

Pre-pregnancy care services are provided by comprehensive health center, mainly midwives. The healthcare provider performs the following steps in providing preconception care to all women: evaluation of vital signs, determination of BMI, assessment of current status for becoming pregnant, history of pregnancy and previous childbirths, examination of the mother's current diseases, screening high-risk behaviors in women and their spouses, screening mental health, and breast examination. A part of preconception care, which includes a clinical

examination, is also provided by the physician.

The woman is referred for laboratory assessment, and if necessary, for vaccination, Pap smear, nutrition counseling, psychological tests, and oral examinations. Then, based on response to the above evaluations, the intervention required for the clients is performed. Next, based on the results of the tests and the history, it is decided whether the woman is a candidate for pregnancy or she should be admitted for further treatment and interventions. The SIB electronic system has all the steps to take in preconception care, and the care provider can click on the desired menu and follow the suggested options.

In general, preconception care should be performed under one of the following conditions: (1) all women who have stopped their contraceptive method or want to stop it, (2) all women who have undergone a negative pregnancy test, (3) all women who are not using any of the methods and have conferred to receive pregnancy prevention methods for the first time and have a tendency to become pregnant in the future; for these women, six months after the first referral, care is taken and the result is maintained as a record for them in the file. It should be noted that until a woman's complication or illness is not remedied or controlled, she is encouraged to use contraceptives to prevent high-risk pregnancies. This care is valid for up to one year, which means that while receiving preconception care once, it is not needed up to one year. Obviously, if one or several health problems are identified in the woman during pre-pregnancy care visit, the provider can help woman manage health conditions and make changes in her life to help her baby be born healthy. In general, preconception care programs in Iran, like three main bases including preconception care, risk assessment, and intervention and health promotion have been developed.<sup>37</sup>

#### *The content of Risk Assessment in Preconception Care by WHO*

In this assessment, the WHO focuses on health problems, behavioral problems, and pregnancy risk factors. The risk assessment recommended by the WHO in the preconception period includes nutrition disorders (malnutrition), vaccine preventable diseases, tobacco use, Environmental health (environmental hazards and toxins), genetic disorders, unintended pregnancy and early pregnancy, STIs such as HIV, infertility, circumcision of women, mental health disorders and epilepsy, drug abuse and sexual violence.<sup>5</sup>

#### *The Content of Preconception Care Program in Iran*

In the integrated electronic system, the content of the risk assessment in preconception care is roughly similar to those recommended by the WHO. This content generally contains several different sections:

1: History-taking (the current status of women have a baby, previous pregnancy and childbirth records, previous

or current history of disease/disorder, high-risk behavior in the woman or her spouse); 2: Laboratory assessment and ultrasound scan; 3: Physical examinations by a physician; 4: Evaluation of immunization status; 5: Feedback of done care; 6: Mental health screening; 7: Genetic counseling (if needed).

The important point is that because preconception care referral is scarce, statistics show that most women who have one or more risk factors for pregnancy do not refer to preconception care; therefore, this risk assessment is postponed to pregnancy period.<sup>36</sup>

#### *Community-Based Intervention Programs to Improve Women's Health*

##### *National Guidelines for Vitamin D Supplementation*

Given the widespread prevalence of vitamin D deficiency, its preventive role in diseases, and the scarce food supply of this vitamin, the vitamin D supplementation program is implemented to meet the needs of the youth age group at all levels of healthcare providers in cities and villages. For this reason, based on the circulars submitted, it is mandatory for all first and second grade students (male/female) to consume vitamin D supplement (50 000 units; one tablet per month and for nine consecutive months).

To all men and women aged 19-59 years referring to urban and rural health centers and health houses, a monthly dose of vitamin D supplement (50 000 units) is given to prevent the related deficiency (12 soft gelatin capsules for one year). The implementation of the national supplementation program with vitamin D mega dose will continue until the time announced by the MOHME and until the beginning of the vitamin D enrichment program.<sup>38</sup>

##### *Intermittent Iron Supplementation Program for Groups at Risk of Iron Deficiency Anemia*

Iron deficiency anemia is also one of the most important nutritional and public health problems in the world. The WHO estimates that about three billion people worldwide have iron deficiency anemia. Children under 5 years of age, adolescents (especially girls), women of reproductive age, especially pregnant and breastfeeding women, are vulnerable groups at high risk of iron deficiency anemia.

For this reason, the Iron Aid Guidelines have been developed by the MOHME, in which one ferrous sulfate tablet per week for a period of 4 months (16 weeks a year) is recommended for adolescent girls (14-19 years old) and boys (15-19 years old). The best time to start consuming iron tablets weekly in this group is start of the academic year for 4 months (16 weeks). Currently, only female high school students are assisted by the Provincial Health Centers through the Iron Program, and iron pills are distributed free of charge in schools. Iron tablets (ferrous sulfate) are recommended for all women of reproductive age (15-49 years) at a 4-month period (16 weeks per year).<sup>39</sup>

### **Studies on Preconception Risk Assessment**

Bayrami et al evaluated the risk of women's lifestyle and the frequency of preconception care. She designed a researcher-made questionnaire based on a Likert scale, which included demographic characteristics of participants and their lifestyle (physical activity, nutrition, tobacco use, stress management, and alcohol use). The answers to lifestyle questions were "I always do", "sometimes I do", and "I rarely do". Results showed that 53.4% of women had not received preconception care. Of those who received preconception care, only 33% consumed folic acid regularly. In addition, 83% of women had not performed oral and dental examinations. Results in the lifestyle assessment also showed that the highest score was related to quitting smoking and tobacco use, and the lowest score was related to physical activity.<sup>26</sup>

Shirmohammadi et al evaluated preconception care for therapeutic abortion applicants using a researcher-made checklist containing four sections. In this checklist, sections one and two assess the cause of abortion (fetal or maternal problems). The checklist includes questions about demographic characteristics, whether or not pregnancy is expected, and the status of preconception care. The third section assesses the individuals who had received preconception care (education, counseling, and preconception intervention). This part includes nine questions based on a 3-point Likert scale (completely, to some extent, not at all) for evaluating preconception training and counseling, and seven yes/no questions for evaluating preconception interventions. The fourth section, which included five questions about the reasons for not receiving preconception care, was also completed for women who did not receive preconception care. Findings of this study showed that 85% of those who applied for abortion had maternal problems and 15% had fetal problems. Moreover, 41.7% of participants with fetal problems and 100% of participants with maternal complications had not received preconception care. While 93.3% of abortion applicants had maternal complications before pregnancy, they were not monitored. In addition, about 48.2% of women in the study needed genetic counseling, but 28.6% had not received any genetic counseling.<sup>27</sup>

Kamalifard et al evaluated preconception care from women's view. The tool used in this study was a preconception screening checklist prepared and adjusted by Hill Meyer. The questionnaire uses three domains of mental health, physical health, and lifestyle. Questions in each domain are scored on a scale of 0 to 100, and the scores are classified on a Likert scale (poor, average, good, and very good). The score range for the questionnaire is between 0 and 100 divided into four categories: poor, average, good, and very good. In this questionnaire, scores 0 to 25 indicate a poor performance, 26 to 50 average performance, 51 to 75 good performance, and 76-100 very good performance in preconception care. The results

showed that preconception care was poor in 75% and moderate in 25% of cases. None of the women in the study received mental health services. The results also showed that preconception care considering lifestyle was poor in 69% and moderate in 29.6% of cases.<sup>24</sup>

Nekuei et al has done several descriptive studies on preconception risk assessment in infertile women referred to infertility centers. In a study in 2012, Nekuei et al evaluated the preconception counseling provided to women undergoing infertility treatment through using a researcher-made questionnaire with two parts. The first part of the questionnaire collects the demographic characteristics including ten items (age, level of education, occupation, category of infertility, cause of infertility, duration of infertility, duration of treatment, treatment performed, outcome of previous treatment, and time of treatment), and the second part is about the training/counseling provided to couples. These trainings are in various sections such as (A) individual counseling: lifestyle (exercise, rest, genetic counseling, and personal health), diet (diet and weight balance), sexual health (sexual activity and STIs), drug abuse (addiction, smoking, and drugs), and psychological factors, and (B) therapeutic counseling: treatment failure, the follow-up of treatment and side effects. The information in this section was completed by interviewing the participants, and the responses included three sections of complete training, incomplete training, and no training. The results showed that in 76.9% of the cases regarding lifestyle, 70.9% regarding diet, 90.7% regarding sexual health, and 90.7% regarding psychosocial aspects of infertility, no training and counseling was given to women taking part in the study. In addition, 46.6% of patients were not counseled for follow-up and treatment.<sup>19</sup>

Moreover, Nekuei et al conducted a preconception risk assessment regarding infertile women. The data of this study were also prepared by a questionnaire and a researcher-made checklist, and were collected through interviews and medical records of clients. Risk assessment in this study includes history-taking (individual, family, medical, medications, menstruation, and pregnancy), routine examinations (physical symptoms, genital, and vital organs), and routine testing (routine, cervical, infection, and biochemical tests). The first part of the questionnaire contains personal information and the second part includes preconception risk assessment, which is designed based on its standard components in reference books. The risk assessment in this study is divided into three sections: (1) history-taking (family, personal, medical, menstrual, medication, and pregnancy); (2) clinical examinations (physical symptoms, genital, and vital organs); and (3) laboratory evaluation (routine tests, Pap smear, and biochemical tests). Data were collected through interviews and medical records of clients. The quality of risk assessment based on medical records and descriptions of participants were divided into three

categories (thoroughly completed, incomplete, and not done). Findings showed that history-taking about personal life had the lowest percent (0.4%) and menstrual history had the highest percent (100%). The lowest percentage of risk assessment was general body examination (3.4%) and the highest for genital organ examination (100%). In terms of laboratory evaluation, the highest percentage was related to routine tests (36.6%) and the lowest to infection tests (4.4%). Based on the results of the present study, most of the components of risk assessment in infertile couples have been evaluated poorly.<sup>20</sup>

Jahani Shourab et al also evaluated preconception care provided to women of reproductive age with a tool designed based on the Donabedian model. The tool consisted of a questionnaire and a researcher-made checklist. The questionnaire used included the characteristics of the participants and the care provider. The checklist evaluates preconception care provided by health care providers in two dimensions of technical and interpersonal interaction. The section of the technical performance of care checklist contains 22 questions with six sections including history-taking, ultrasound scan, laboratory assessment, immunization, recording the measures taken, and the required measures and training section. The interpersonal interaction section also included 22 questions about the interaction between the care provider and the participants. The way to score questions on technical performance and interpersonal interaction questions was that each item was evaluated with three options "Done, 2 points", "Incomplete, 1 point", and "Failed, 0". Any choice made entirely by the healthcare provider was assigned a "score of 2", a choice that was incomplete a "score of 1", and a choice that was not made a "score of zero". The total scores for the technical performance section were 52 points and for the interpersonal interaction section were 44 points. Finally, after obtaining the sum of scores, in order to match with the optimal level of cares, the sum of the scores was calculated as a percentage and divided into three levels of weak (zero to 33%), moderate (34-66%), and desirable (67-100%). The results of the study showed that the preconception care process was moderate in 93% of cases. The results of the study on the percentage of compliance of care delivery with the desirable status of care process components showed that in 88% of cases the technical performance of healthcare providers and in 90% of cases interpersonal interaction between healthcare providers and clients were in a moderate level.<sup>23</sup>

Ghaffari Sardasht et al evaluated the frequency of risk factors associated with pregnancy among women seeking planned pregnancy. This descriptive study was conducted on 350 females of childbearing age who referred to health centers of Mashhad, Iran to receive preconception care. The sampling was performed using the multistage sampling technique. The data were collected by a researcher-made questionnaire enquiring the patients' demographic and obstetric data. According to the results,

the age of 2% and 4.9% of the participants was <18 and >35 years, respectively. The most frequent risk factors for pregnancy health were related to gestational diabetes (32%), preeclampsia (22%), abortion (19.1%), history of vaginal bleeding in the second half of pregnancy, and preterm delivery (13%). In addition, the most frequent underlying diseases were diabetes mellitus (22%), thyroid disorders (22%), heart disease, as well as asthma and allergies (13%).<sup>40</sup>

Eslami et al also evaluated the prevalence of behavioral risk factors along with reproductive and medical risk factors threatening pregnancy. The instrument used was a structured questionnaire completed by self-report method and review of medical records and cases. The data included demographic, midwifery, medical, and behavioral characteristics before and during pregnancy. The questionnaire was designed in four sections. The first section contained demographic characteristics and insurance status of individuals. The second section contained behavioral risk factors, such as tobacco use and drug abuse, especially during preconception. The third part contained the complications of recent pregnancy, such as the prevalence of preeclampsia or postpartum hemorrhage. Finally, the fourth part contained the underlying diseases of the mothers such as anemia, diabetes, hypertension, and other cases. Findings showed that 6% of women were not covered by insurance. Moreover, 27.5% of women reported unwanted pregnancy and 5.5% did not refer to receive care during their pregnancy. In addition, 7.1% of women used tobacco and hookah and 0.9% used drugs. Results of their pregnancy showed that preterm birth rate was 6.8%, the percentage of infants under 2500 g was 7.7%, and stillbirth was 1.2%. The most prevalent complications of pregnancy were urinary tract infection (32.5%), anemia (21.6%), and thyroid disorders (4.1%).<sup>41</sup>

Ahmadinejad et al evaluated the performance of care providers while providing preconception care with a researcher-made checklist. Provision of preconception care was evaluated based on the checklist; if a part was done in a correct way, then the score (1) would belong to it. If the intended actions were carried out without considering standard principles, the score (0.5) would be given. The score (0) was given if the intended actions were not done. The total of the questions had 12 points and were divided into three equal parts to determine the level of compliance with the desired status. For example, the score 0 to 4 showed poor, 5 to 8 moderate, and 9 to 12 desirable status. The results of the study showed history-taking of complications and diseases by care providers was in a poor status in 14.3% and moderate in 42.3% of cases. The results in clinical treatment section were moderate in 82% of cases. In the immunization unit, 43% were poor and 42% were moderate. The results showed that in 82% of the cases, the education provided by the health care provider was poor.<sup>22</sup>

Latifnejad Roudsari et al assessed health behaviors



of women before and during pregnancy. The data collection tool was a researcher-made questionnaire consisting of three sections. The first section was about the demographic characteristics of women, the second section assessed their knowledge and attitude towards preconception healthcare; and the answers to attitude questions were based on the Likert scale. The correct answer to the knowledge questions would get 2 scores, the wrong answer would get zero, and the answer "I don't know" one score. The third section was a healthcare checklist provided by the healthcare staff; the responses to this section were measured with yes/no options in a way that if the participants had performed blood tests, the yes option was marked otherwise, the no option was marked. The third part of a Likert-scale questionnaire also assessed the health behaviors of the participants. For example, regarding physical activity per week, the options were different (I do not exercise at all; I exercise once a week; I exercise every day). The results showed that 31% of women received preconception care, 33% had oral examinations, 33% had undergone laboratory assessment, and 39% had consumed folic acid correctly; but only 6% of women had physical activity and 9.6% of women had genetic counseling.<sup>25</sup>

Mehroolhassani et al conducted a review study to evaluate premarital counseling based on the Donabedian model in Kerman. In this study, the evaluation of premarital counseling was investigated in three dimensions as follows: structure, process, and outcome. Therefore, the studies were categorized into three sections. In the dimension of human resources structure, educational content, information resources, and facilities are evaluated; the pre-marriage counseling process is examined in two parts of the counseling and training mechanisms. In the aftermath of care, couples' knowledge, attitude, and satisfaction were assessed. The results of this study showed that educational content in sexual health, reproductive health, and mental health is inadequate and needs to be reviewed. The process of consulting and training provided by the service provider was in the range of good to average. The important point is that the timing of the consultation is limited due to the high volume of content. The results of the preconception outcome showed that the level of knowledge and attitude of couples in the field of reproductive health, sexual health, and intercourse was moderate to poor. However, the satisfaction of the participants was high.<sup>42</sup>

## Discussion

The results of present study showed that health centers were the main research environment in different studies. Also, the studies mainly focused on preconception care provided in health centers. Various researchers in Iranian cities from different geographical and cultural conditions as well as health centers have evaluated preconception risk assessment with different methods. The target group of all studies was women of reproductive age, indicating

that preconception care in Iran is provided to women of reproductive age. Researchers evaluated the care provided to women of reproductive age by various instruments because of a lack of national standard tool for assessing the preconception risk.

The studies by Jahani Shourab et al and Ahmadinejad et al evaluated the preconception care during providing care, while other studies evaluated preconception care from women's views of reproductive age after receiving care.

However, the common finding in different studies was that the current performance of healthcare centers regarding preconception risk assessment is moderate.

In the study by Latifnejad Roudsari et al 6% of women with planned pregnancy had physical activity, 33% had dental examinations, 9.6% genetic counseling, and 33% had laboratory assessment.<sup>25</sup> In the study by Bayrami et al 83% of women with planned pregnancy did not have dental examinations,<sup>26</sup> which is line with the results of the study by Latifnejad Roudsari et al.

In Kamalifard et al study, the scope of pre-pregnancy care in the area of physical health was either weak (75%) or average (25%). All women declared that they had not received mental health-related care during the pre-pregnancy care. Generally, the scope of pre-pregnancy care in the area of life-style was categorized as weak and average.<sup>24</sup>

Jahani Shourab et al adapted the preconception care in both technical and interpersonal interaction dimensions with the optimal situation. Jahani Shourab et al reported that care delivery was moderate in 88% of cases in technical performance section of healthcare providers and 90% in interpersonal interactions among healthcare providers and clients.<sup>23</sup>

The results of Ahmadinejad's et al study are similar to those reported by Jahani Shourab et al. In Ahmadinejad's et al study, history-taking by care providers was poor in 14.3% and moderate in 42.3% of cases. The risk assessment of clinical examination was moderate in 82% of cases. In addition, risk assessment in immunization part was poor in 43% and moderate in 42% of cases.<sup>22</sup>

In Iran, risk assessment begins before the pregnancy and continues during pregnancy, childbirth, and postpartum. However, risk assessment during pregnancy is performed with greater sensitivity. With the launch of the integrated electronic health system, maternal health risk assessment has expanded to include preconception care, pregnancy care, postpartum care, thromboembolism screening, congenital malformations screening, and mental screening. A study by Shirmohammadi et al after launching the electronic health system showed that about 48.2% of women seeking therapeutic abortion needed genetic counseling, but 28.6% did not receive any genetic counseling. The results also showed that in most of the applicants for therapeutic abortion, maternal or fetal risk factor existed before pregnancy. Also, most of the applicants with maternal reason for therapeutic abortion

were diagnosed with problems before pregnancy; this means that most of the mothers became pregnant despite their knowledge about their problem. Moreover, about 48.2% of women in this study needed genetic counseling, but 28.6% did not receive any genetic counseling.<sup>27</sup> However, about 30 000 to 40 000 disabled and defective infants are born in Iran each year, and a considerable number of them continue to live with great suffering. These children not only have severe physical, spiritual, and psychological problems but also cause many psychological and economic problems for families and the government.<sup>43</sup> Since risk factors are systematically ranked, adjusted, or eliminated in the risk assessment phase in pre-pregnancy period, more attention should be paid to preconception risk assessment so that pregnancies could start and continue in safe conditions.

Following the examination of preconception risk assessment, we review genetic counseling, which is part of preconception counseling, preconception care, and pregnancy period care. In Iran, because of the mandatory genetic counseling before marriage, all couples who are planning to marry are screened for thalassemia. Genetic screening is also performed during pregnancy, and all women with abnormal babies are given permission for abortion. Because of the sensitivity of the subject, almost all women who go to public and private centers are screened. During pregnancy, screening tests are performed twice, and if abnormalities are detected, therapeutic abortion is permitted; but in preconception care, there is little sensitivity to genetic counseling, as stated in the study by Shirmohammadi et al.<sup>27</sup>

The results of the study by Mehroolhassani et al showed that counseling and training by providers is ranging from moderate to good, but educational content in reproductive health, sexual health, and sexually transmitted diseases is defective. Also, there is limited time available to provide a large volume of pre-marriage educational materials.<sup>42</sup> If pre-pregnancy risk assessment begins with pre-marital counseling, like thalassemia during this period, it will lead to promotion of the health level of men and women of reproductive age. According to the Up-to-Date database, one of the best times to get preconception counseling is pre-marriage counseling.<sup>44</sup>

Another type of risk assessment is the formulation of packages for different age groups for men and women of reproductive age. The studies show that the content of health packages for the adolescents, youth, and middle-aged people is almost comprehensive, but these packages do not mention reproductive history and planning for pregnancy. It is worthwhile to mention that if preconception cares, like health packages are formulated for different age groups and the package content for each age group is specific to the same age group, the risk assessment will be thorough and comprehensive. In assessing the risk of preconception care, the women's lifestyle including occupational risks, environmental risks and damages,

social health, and diet and activity patterns are not evaluated. Although the epidemiology of diseases is not the same in the country, the content of preconception care is equally distributed everywhere in the country, whether urban, rural, or suburban. Studies show that in the United States each state has different policies and different risk assessments in assessing preconception risk.<sup>45</sup>

There is a National Maternal Mortality Surveillance System in Iran that retrospectively assesses the risk factors of pregnancy health in deceased women, but in United States there is a system called the Pregnancy Risk Assessment Monitoring System (PRAMS). The system was launched in 1987 to reduce the morbidity and mortality of neonates resulting from pre-, intra-, and post-pregnancy behaviors of mothers. It is a joint research project between the Ministry of Health (Department of Reproductive Health) and Centers for Disease Control and Prevention. The system detects at-risk women and infants and monitors changes in their health status.<sup>45</sup>

The Behavioral Risk Factor Surveillance System (BRFSS) conducts more than 400 000 interviews with adults annually, making it the largest continuing health screening system in the world. The system has a questionnaire designed by a working group of BRFSS state coordinators and CDC staff. The questionnaire is a set of questions asked by all states and includes questions about the demographic characteristics of individuals as well as questions about current health behaviors, such as tobacco use and seat belt use.<sup>46</sup>

In Iran, preconception care is provided by comprehensive healthcare centers by health providers to eligible women of reproductive age. A review of models of preconception care in countries around the world, including Iran, showed that each country has a specific strategy for assessing preconception risk. In Hong Kong, in their first visit, women complete their preconception check-up checklist, including underlying illnesses, drug use, gynecological complications, high-risk behaviors, etc. The couples are then given a CD packed to take home for examination. This pack contains pregnancy preparation lessons. Laboratory assessment is also performed on the first visit. In the second visit, the nurse reports the response to the client and advises the patient or couple to adjust or treat the case or cases reported. In this type of care, couples pay some money for the services provided.<sup>47</sup> In the United States, preconception care services for low-income women are covered by insurance so that poor and marginalized women can also benefit from these services. In Netherlands, there is a valid internet questionnaire having validity and reliability available to everyone for free. The questionnaire identifies the risk factors for the individual and is eventually emailed to the service provider.<sup>48</sup>

In 2014, United States researchers announced that a key challenge in preconception care is to identify the best way to provide these cares. They attribute the heterogeneity

of risk factors, health systems, and preconception care strategies to lack of consensus on the best way to deliver preconception care. Generally speaking, the best possible model is a combination of all the above methods, which vary depending on the circumstances and types of people. In addition to benefiting from different models of care, other resources can be used to provide preconception care, such as mass media (radio, television, etc.), social marketing campaigns, and community-based approaches such as food enrichment, for example food enrichment with folic acid.<sup>49</sup>

Comparison of the content of preconception health packages in Iran with a questionnaire designed by the CDC and a valid questionnaire in the Netherlands shows that in these questionnaires, the questions related to some sections have been asked in more details. In the CDC questionnaire, respondents are asked about their diabetes, hypertension, and depression or mental disorder over the past three months. The preconception questionnaire available in Iran asks about several diseases including the above diseases, too. In the CDC questionnaire and the valid questionnaire in the Netherlands, one of the questions is whether during the past year a care provider has talked to you about “How many children do you want to have in your reproductive life? Talk about having mental and physical health before you become pregnant, about the illness or illnesses you have, the status of tobacco use”, and questions like that. The questionnaire available in Netherlands, both free and online, addresses the following: examining the pattern of nutrition, anorexia or nervous overeating, and radiation exposure of couples. This questionnaire lists several genetic disorders that are examined in men and women. Diseases in the woman or husband and the type of medication they are taking are also examined; if the woman or her husband is employed, they are examined for exposure to chemical or radioactive substances or exposure to the chemotherapy drugs. In this questionnaire, women are asked about pregnancy or previous pregnancies, concerning infection with preeclampsia and gestational diabetes, which is missing in the preconception questionnaire available in the country. In this questionnaire, several sexually transmitted diseases, such as chlamydia, gonorrhea, etc., are examined, which is not mentioned in the questionnaire available in the country.<sup>1,50</sup>

In Bayrami et al study, women's experiences manifested several areas within which changes could be applied to improve the quality of preconception care, such as Preconception care for couples and access to information about Preconception healthcare.<sup>51</sup>

### Conclusion

There is still paucity of studies assessing the risk in pre-pregnancy period. The results of existing studies show that there are shortcomings in the content of preconception care. Current preconception care does not assess social,

economic, and lifestyle risks and due to demographic and epidemiological changes in diseases, this program needs to be revised. Gestational diabetes mellitus and hypertensive disorders of pregnancy are two of the most common pregnancy complications that adversely affect both short-term and long-term maternal and fetal outcomes. Therefore, assessment of separate risk should be designed for these two complications in pre-pregnancy period so that patients can be fully evaluated for risk.

Another point is that healthcare centers provide more accurate patient care if health centers have access to the patient's medical records in the hospital and the hospitals have access to the patient's reproductive and disease history records in the health centers. Since the demographic and fertility profile of women of reproductive age varies from province to province, the preconception care provided in each city and province should be adjusted. Weakness in the referral system is one of the problems in providing preconception care. In the referral system, there is lack of communication between different parts of referral levels and lack of proper feedback from higher and lower referral levels.

Since the majority of preconception risk assessment is performed in comprehensive healthcare centers, healthcare providers must receive appropriate training, and periodic retraining courses must be conducted. On the other hand, by reversing the percentage of urban and rural population compared to three decades ago, population density in the city and suburbs (or casual settlements), poor primary healthcare coverage in cities and suburbs, poor care coverage of healthy people, risk factors and NCDs in rural areas of the country, as well as prevention and control of risk factors such as inactivity, maladaptive eating habits, addiction, smoking, and environmental pollution with new pollutants have created special conditions, and these difficult and complex conditions require their own set of policies.

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### Research Highlights

#### What is the current knowledge?

Various texts are available on preconception risk assessment. Assessment guidelines and national instructions show that health services packages have been developed for adolescent, young, middle-aged groups, whereby men and women of reproductive age are assessed for risk and necessary care.

#### What is new here?

The preconception care is a component of integrated maternal health care program that is faced in its content and faces challenges in implementation.

### Authors' Contributions

NA, MSH, AK: Conceptualization and formulation; FGHS: Writing of the review of literature; FGHS, ZM: Data collection; FGHS, ZM: Data analysis and processing; FGHS: Manuscript writing, review, editing, and revising of final paper. All authors have read and agreed to the published version of the manuscript.

### Conflict of Interests

The authors declare no conflict of interests in this study.

### Data Accessibility

The datasets are available from the corresponding author on reasonable request.

### Ethical Issues

This study has been extracted from a research project approved by Vice President of Research of Shahroud University of Medical Science (code: IR.SHMU.REC.1398.025).

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