

Priority setting in cardiovascular research in Iran using standard indigenous methods

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Background: Determining cardiovascular disease (CVD) research priorities is essential given the high burden of these diseases, limited financial resources, and competing priorities. This study aimed to determine the research priorities in CVD field in Iran using standard indigenous methods. **Materials and Methods:** An extensive search was done in relevant international and national studies. Then, an indigenous standard multistage approach based on multicriteria decision analysis steps was adapted to local situation and implemented. This process included forming a working group of experts in priority setting methodology, identifying the context and prioritization framework, discussing the methodology with the National Network of CVD Research (NCVDR) members who ultimately determined the priority research topics, weighted topics criteria, ranked topics, and reviewed all determined research priorities for final report. **Results:** Thirteen cardiovascular research priorities were determined by the NCVDR members. The first five priorities based on their scores include studies in hypertension, prevention and control of ischemic heart disease (IHD) and its risk factors, burden of IHD, Registration of CVDs, and COVID-19 and CVDs. **Conclusion:** Cardiovascular research priorities were determined using a standard indigenous approach by national experts who are the NCVDR members. These priorities can be used by researchers and health decision makers.

Key words: Analytic hierarchy process, cardiovascular diseases, decision support techniques, health priorities, low-and middle-income countries, multicriteria decision analysis

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INTRODUCTION

Cardiovascular disease (CVD) is an important cause of premature death^[1] that causing 10.8 million deaths, which were approximately 35% of the total deaths in Asia in 2019. The proportion of premature deaths in Asia (39%) was notably higher than that of premature CVD deaths in the United States (23%), Europe (22%), and globally (34%) (2). Fifty percent of CVD mortality and 80% of global CVD burden occur in low- and middle-income countries (LMICs).^[2,3] With an 11% prevalence, Iran has the highest CVD rate in the Eastern Mediterranean region. Compared to developed countries with 80% deaths at retirement age, most deaths occur in active age in developing countries.^[4] A great financial burden is created for individuals, their families, and society by premature death and the loss of active life years. While in high-income countries, CVD is a top priority disease for management,^[5] it is the leading cause of death and the most important source of disease burden in middle- and low-income countries that is ignored.^[6] Based on the Commission on Health Research for Development, even though 90% of the world's preventable deaths occur in LMICs, poor research background is available in these countries.^[7]

Research on regional and national health priorities is essential to provide the required evidence for specific regional and country solutions, especially in third world countries with limited resources; research priority setting in the health area is more important to maximize the impact of research investments and turn custom research programs into agendas tailored to the real needs of the country.^[8] A high-quality standard process must be used to select target research with the benefit to public health by the health research prioritization process.^[9] There are several approaches to prioritizing health research, such as Combined Approach Matrix,^[10] Essential National Health Research,^[11] the Child Health and Nutrition Research Initiative,^[12] the COHRED management process to priority setting,^[13] and multicriteria decision analysis (MCDA).^[14] Each of these methods emphasizing on an aspect of this process. Since prioritization is a multidimensional process and context is an influential factor in this process, it is different in each environment. It is very difficult to reach an agreement to determine the appropriate method or gold standard.^[15] Therefore, experts and policymakers in various fields design, localize, and implement an appropriate and comprehensive prioritization approach to determine the research priorities according to their needs and characteristics of society's economic, social, and cultural structure and existing facilities and infrastructure.^[16]

Due to the multidisciplinary nature of issues related to cardiology and the wide range of research needs in this

field, despite the lack of resources, it is necessary to consider a way to exchange different priorities and select the most important and relevant of them according to the needs of the country. The MCDA approach is in line with this aim; therefore, this prioritization approach is localized in this research. This approach includes a set of methods for decision-making based on more than one criterion that highlights the impact of all applied criteria and their relative importance in prioritization.^[17]

The steps of this approach include determining the decision-making framework, collecting information on various research topics, setting criteria, criteria weighting, scoring subjects based on criteria, determining the overall scores of subjects, and their ranking.^[18] This approach has been used in the Netherlands,^[19] Nepal,^[20] Thailand,^[17] Ghana, and Uganda^[21] to identify the most important health problems and evaluate the efficiency of health systems.

The aim of this study was to determine cardiovascular research priorities using a standard indigenous method that performed by the Iranian Network of Cardiovascular Research in response to the Ministry of Health (MOH) in Iran. Many reasons led to such request by the MOH like the recent epidemiological and demographic changes in Iran that have led to changes in disease and mortality patterns,^[6] changes and reorientation of the health systems, and the responsibility of this network in setting priorities of Cardiovascular research.

MATERIALS AND METHODS

Based on the official request of the Vice-Chancellor of Research and Technology of the MOH in Iran to determine the national research priorities in the field of CVD by the Iranian Network of Cardiovascular Research, the following steps were determined. The process started with an extensive search and studying the relevant evidence at international and national levels. Considering the role of social, economic, cultural and health systems structure, as well as the research environment of each country, the process of prioritization has different approaches to achieve priority research topics; therefore, the process started with a native standard model was implemented using the MCDA model based on the following steps:

Forming a working group of experts in priority setting

The members of this working group were responsible for the design, leadership, and operations of setting priorities. They identified the skills, expertise, and resources needed for the prioritization process, contacted experts to participate in the prioritization process, and collected and managed information. The group coordinated and managed discussions and data analysis to select appropriate

strategies. The working group was formed at the Secretariat of the Iranian Network of Cardiovascular Research to make the necessary coordination with an expert panel at the national level.

Identifying the context and framework of the prioritization process

The working group members investigated the effective factors in the prioritization process, such as available financial and human resources, strategic research priorities, values and principles of stakeholders and policymakers, and the policies governing health research in the country, before starting the process. Then, the prioritization framework was adjusted.

Determining the members of expert panel

At this step, the working group members determined the cardiologists who could be members of the prioritization expert panel. The set inclusion criteria that consist of being certified cardiologists, having long experience in this field, being well known and familiar with the problems of CVD in the country and having interest in cooperation. The panel members were selected among the Iranian Network of Cardiovascular Research members. The latter were cardiologists representing different universities of medical sciences and cardiovascular research centers in the whole country with sufficient experience and expertise in CVD research. In addition, specialists in other related fields such as nutrition, health education, statistics, epidemiology, psychiatry, health service management, and health economics were selected to consider their opinions in the prioritization process. Conflicts of interests were collected at the beginning of the process. Then, the plan of prioritization process was determined during virtual meetings with the panel members.

Collecting information to determine cardiovascular research priorities

Research priorities were determined as follows: 1. A survey of expert's panel members, 2. Reviewing the proceeding of the Strategic Council of Iranian Network of Cardiovascular Research in the past few years and extracting the most important subjects, approved plans, and priorities, 3. Searching the sites of internal, regional and international cardiovascular research networks and centers, 4. Use of strategies and suggested subjects in articles in the field of CVD in Iran, 5. Studying review articles, and use of the limitations and suggestions of the articles.

Selecting criteria for priority setting in research topics

The appropriate criteria were identified for prioritizing cardiovascular research topics using a survey of the expert panel, searching and reviewing related texts, and reviewing the proceeding of the Strategic Council of Iranian Network

of Cardiovascular Research. Finally, nine criteria were determined for priority-setting the research topics.

Preparing a table of criteria and priorities

The working group analyzed the opinions of the expert panel members during several sessions and modified, summarized, or merged proposals. Finally, a table containing seven criteria and 13 topics was selected and used for further processes.

Weighting criteria (index) for prioritizing cardiovascular diseases

The importance of the criteria from the perspective of the subjects was assessed by the weighting processes. The weight of each criterion indicates its relative importance compared to other criteria. Several methods for weighting research criteria include focus group discussion, goal programming, weighted score method, Analytical Hierarchy Process (AHP), VIseKriterijumska Optimizacija I Kompromisno Resenje, Technique for Order Preference by Similarity to Ideal Solution, etc.^[22]

The AHP is a complete and accurate method. In this method, pairwise comparison of criteria is conducted first using the common indicators of language and then by assigning an appropriate numerical score to each criterion based on the degree of importance or preference between the two decision elements.

These judgments are considered quantitatively between 1 and 9, so that 1, 3, 5, 7, and 9 show the same preference or importance, slightly preference or importance, strong preference or importance, very strong preference or importance, absolutely preference, or importance, respectively. Preferences between the criteria scores are scored 2, 4, 6, and 8, respectively.

The highest score shows the important criteria.^[23] This method was used to weight the prioritization criteria in this study. An important feature of the AHP is consistency control in responses. In this method, the ratio consistency is calculated for the comparisons by each subject. A ratio of more than 0.1 shows inconsistencies in the answers and comparisons by the subjects. The ratio consistency is obtained by dividing the consistency index by the randomness index.^[24]

To implement the AHP to weight the research criteria, the working group first presented Table 1, which included detailed definitions of each criterion to make the same understanding for all members of the expert panel who participate in the weighting process. Then, the research criteria weighting questionnaire [Appendix 1] was designed, and the method for its completion was described through a 2-h virtual meeting with members of the expert panel.

Table 1: Prioritization criteria (indexes) definitions of research topics

Row	Index	Index definition
1	Importance of subject	It reduces the burden of cardiovascular disease (Burden of disease), in other words, reduces the mortality rate, prevalence, incidence, and side effects of the disease, and improves the quality of life
2	Cost effectiveness	Reduce the economic burden of cardiovascular disease Improve health outcomes such as the number of free-symptom days, saved lives, or the number of LYGs
3	Align with national, regional and international priorities	The subjects are aligned with national (documents of the health system), regional and international priorities (World Health Organization and other related organizations) Provide valid and appropriate evidence for planning and policymaking.
4	Feasibility	Possibility to research according to the existing infrastructure, technology, human resources, financial capacity (affordability), current laws, time, and ethical considerations in the subject
5	Health equity	The issue will lead to a fair distribution of prevention, diagnosis, treatment, and rehabilitation services in terms of socio-economic indicators such as gender, education, income, place of residence, ethnicity, religion, etc.
6	Acceptability in the community	The subject should be accepted by policymakers and people
7	The potential of the subject to improve the quality of care and the consequences of the disease	The subject will lead to improving the quality of services to patients, reducing the side effects and consequences of the disease, and improving the results

LYGs=Life-years gains

The panel members sent their completed forms to the working group up to 2 days after the meeting.

Creating a matrix for prioritizing cardiovascular research topics

Expert panel members reviewed and scored each of the research priorities based on the seven criteria through the five-point Likert scale (1–5) using completing the prioritization matrix.

Questionnaire analysis

Participants' responses to the research criteria weighting questionnaire were analyzed by Expert choice software, and the weight of the research criteria was determined. IBM SPSS Statistics 24 (New York State, USA) was used to analyze the prioritization matrix data. The weighted mean was calculated for each question. Thus, the weight

of each criterion was multiplied by the average score of that criterion (indicator). The scores of the indicators were added, and the score of each question was determined. Then, the priority of the questions was determined according to the obtained scores.

Ethics

This study was based on the agreement of experts and specialists to determine cardiovascular research priorities based on the standard indigenous model and therefore had no human or animal samples.^[8]

RESULTS

Twenty members of expert's panel and the working group filled out the research criteria weighting and the research topics prioritization questionnaires.

The output of expert choice software to determine the weight of research criteria showed that the highest weight with a large difference belongs to feasibility (0.318) and the lowest weight belongs to the alignment with national and international priorities (0.051). The other criteria were placed with a small difference between these two criteria [Table 2]. The ratio consistency in the responses of all participants was <0.1, which shows that there was no inconsistency in the answers and comparisons by the participants.

Thirteen cardiovascular research priorities were ranked by the expert's panel. Top priorities based on the scores included studies in hypertension, prevention, and control of ischemic heart disease (IHD) and its risk factors, burden of IHD, Registration of CVDs, and COVID-19 and CVDs. Other priorities are presented in Table 3.

After determining the cardiovascular research priorities and approval by the expert panel members, the priorities were presented to the Vice-Chancellor for Research of the MOH by a report containing the details of the implementation of the prioritization steps. After approving a report by the Vice-Chancellor, the research priorities were uploaded to the National Institute for Medical Research Development (NIMAD) website. At the time of writing this paper, four proposals had been submitted to the institute based on the set priorities.

DISCUSSION

This study localized and implemented an innovative approach to prioritize cardiovascular research topics. According to our information, this was the first time such a project was carried out to prioritize cardiovascular studies in Iran.

Identifying and determining cardiovascular research priorities is necessary due to the burden of diseases,

Table 2: Determining the weight of criteria for prioritizing research titles

Row	Criterion title (index)	Weigh
1	Feasibility	0.318
2	Cost effectiveness	0.139
3	Health equity	0.135
4	Subject importance	0.134
5	Potential of the subject to improving the care quality and consequences of the disease	0.121
6	Acceptability in the community	0.101
7	Alignment with national, regional and international priorities	0.051

Table 3: Prioritization of research topics based on topics

Rank	Research title	Score
1	Studies on hypertension	4.35
2	Prevention and control studies of ischemic heart disease and its risk factors	4.20
3	Studies on burden of ischemic heart disease	4.13
4	Registration of cardiovascular diseases	4.08
5	Studies on COVID-19 and cardiovascular disease	3.94
6	Implementation Research in the field of cardiovascular disease	3.88
7	Studies in the field of interventional therapeutic measures of cardiovascular diseases	3.84
8	Guideline design (developing, adapting and updating) for cardiovascular disease and related risk factors	3.83
9	Studies for preparing risk assessment models	3.78
10	Studies on the treatment of cardiovascular patients by Digital Health or Telemedicine (preparation of appropriate applications or models of Telemedicine treatments)	3.61
11	Studies on the methods of diagnosing cardiovascular diseases	3.57
12	AI and machine learning studies in the field of cardiovascular disease	3.32
13	Genetic and epigenetic studies in the field of heart disease	3.10

AI=Artificial intelligence

limited financial resources, and competing priorities.^[25] For this purpose, the MCDA approach was localized and implemented through inspiring by the standard prioritization approaches. Our findings showed that this approach is comprehensive, potentially applicable, and acceptable to experts and policymakers.

Decision-making is a dynamic process with the interaction between policymakers, experts, and stakeholders. Decisions must be made based on scientific evidence. However, the results are often not used by policymakers and decision-makers.^[16] The participatory nature of this approach, which involved policymakers, experts, stakeholders, and senior academic researchers, led to communication and exchange of knowledge and experience

between them. It reduced the gap between researchers and policymakers in understanding the country's context and identifying priorities. In selecting key decision makers, our goal was to select individuals from different health system decision-making hierarchy levels. So that, an attempt was made to consider the diversity of specialists and stakeholders in terms of geographical location, gender, role in the health system, and some criteria such as experience and expertise, and interest in the subject. Thus, decision-makers in this study included people who participated in national decisions (members of the Strategic Cardiovascular Council), people involved in executive levels at different universities, physicians and specialists in other fields, and experienced academic researchers. In addition, experts in various fields (nutrition, health education and promotion, statistics, epidemiology, psychiatry, health services management, health economics) were selected for the prioritization process. The extensive participation of experts from different disciplines and departments makes the results of the prioritization process more effective for several reasons. First, it minimizes the chance of ignoring different research priorities; because different stakeholders prioritize research topics differently.^[26,27] Second, participation in the prioritization process increases the sense of ownership of the determined priorities, and consequently, the probability of implementing the selected priorities increases. Third, the broad participation of stakeholders makes the priorities meet the needs of the people who will benefit from the research priorities, and the selected priorities will be a better response to social and political requirements. It increases the overall validity of the process and its impact on health equity.^[28] In addition, the participation of experts prevents unnecessary repetition of the prioritization process and wasting resources.^[29]

A combination of consensus-based methods was used through focus group discussion and individual survey methods to prioritize research topics at different stages of the process. Initially, research topics and basic criteria were determined by expert consensus. The final priorities were then identified using an individual survey. The use of the agreement method increases the acceptability of the prioritization process, and individual ranking prevents the dominance of several participants on the results. Given that specialists in different fields have different knowledge and experience, the use of a combined approach leads to a balance in considering stakeholders' different values and perspectives.^[10]

One of the strengths of this study was the use of 7 different criteria for decision-making and the weighting of these criteria based on the hierarchical analysis process. The effectiveness of this method has been confirmed for accurate determination of priorities in

some studies.^[30-32] Selecting several appropriate criteria is critical for the MCDA approach.^[21] In this study, the feasibility criteria had the highest weight. Health systems in LMICs have a well-defined hierarchical structure with limited decision-making powers for lower levels.^[22] Hence, considering the limited resources and potential barriers to researching in these countries,^[33] it is essential to consider the feasibility of research following policies and laws, financial resources, human resources, existing infrastructure, technology, time, and ethical considerations. Avan *et al.* investigated the feasibility of the research as the most important criteria for implementing an information platform to decision-making based on health data in three countries of India, Nigeria, and Indonesia.^[34] In the study of Ghandour *et al.* on priority-setting of CVD research at 4 Eastern Mediterranean countries, feasibility was considered one of the five main criteria for prioritizing research titles. Still, the research criteria were not weighted.^[16]

Examination of the study using the MCDA method^[35-39] showed that most studies extensively involve problem organization (e.g. participant selection, options, and criteria), MCDA modeling (e.g. weighting, scoring, and aggregation); and decision-making (e.g. explanation of results and decision-making) but each study had different goals, such as ranking health programs,^[39] health policies,^[16] health technologies,^[37] or prioritizing drugs and vaccines.^[35,36,38] MCDA participants were key stakeholders but the general public was included as participants in some of the studies. Furthermore, the number of participants was very scattered. The criteria used in the analyzes were mainly related to the purpose of the study and mostly included health benefits, general health, economic, environmental, epidemiological, or demographic factors. In addition, the technical aspects used in the studies include the type of MCDA technique, visualization (graphical interface for inputs and outputs), sensitivity analysis (evaluation of the effect of uncertainty in the final ranking), and cluster analysis (evaluation of potential user groups, criteria or technologies) were different.

Studies on hypertension were selected as the first cardiovascular research priority in Iran by expert's panel. It is estimated that about 1.4 billion people worldwide have high blood pressure.^[40] Furthermore, hypertension is the most common disease among CVD, in Iran.^[41] According to the results of a national meta-analysis study, the prevalence of hypertension in Iran is 25% (25% in women and 24% in men). The highest prevalence was in the elderly (42%).^[42] In another national meta-analysis study, the prevalence of prehypertension, hypertension, information about hypertension, treatment of hypertension, and the rate of control in Iranian people were 31.6, 20.4, 49.3, 44.8, and 37.4, respectively.^[43] Statistics show prehypertension or hypertension in half of the Iranian adult population. Also,

in school-age children the prevalence of prehypertension and hypertension were 4.8 and 7.8%, respectively.^[44] The increasing prevalence of hypertension, similar to other CVDs, is associated with increased life expectancy, socioeconomic changes, urbanization, and lifestyle.^[41] More considerable is the problem of patients not aware of their disease and have uncontrolled high blood pressure, which highlights the need for studies on blood pressure as one of the significant priorities in the cardiovascular field.

Prevention and control of IHD and its risk factors and burden of this disease were selected as the next priorities. IHD affects around 126 million individuals globally (1655 per 100,000), which is approximately 1.72% of the world's population.^[45] Among CVDs, IHD is the leading cause of death and disability-adjusted life year (DALY) in Iran and the world. Population growth and increased life expectancy can increase the incidence of diseases in Iran.^[46] In addition, a 50% and 33% increase in DALY rates in men and women under the age of 60 can lead to an increase in IHD during productive years of life and consequently economic problems.^[47] Despite significant advances in diagnostic and therapeutic methods of IHD in Iran in recent years, the burden of the diseases is still high. This may be due to increased life expectancy, cultural, economic, social status, unhealthy lifestyle due to urbanization and industrialization, increased physical and metabolic risk factors, low access to primary care and treatment services and inability to pay for these services, and low adherence to treatment due to psychological and economic problems.^[41] Therefore, studies to prevent and control IHD by controlling risk factors and improving diagnostic and therapeutic methods are one of the most important research priorities and at the top of the agenda of the MOH in recent years.

Registration of CVD was another selected priority. The disease registration system leads to the production of valuable databases to increase awareness about the disease's status and the gaps and challenges in their prevention and treatment and lead to the design of more effective strategies for the prevention and control of disease. This data can also design evidence-based guidelines for the prevention, management, and treatment of diseases.^[48]

Another priority was the research in COVID-19 and CVD. In patients with COVID-19 disease, the globally prevalence of hypertension was 22.9% and 9.7% for CVD.^[49] In Iran, cardiovascular disorders were the most prevalent comorbidities in COVID-19 (21%).^[50] CVD in patients with COVID-19 appears to be associated with worse outcomes and increased risk of death. In addition, COVID-19 can cause myocardial damage, arrhythmias, acute coronary syndrome, and deep vein thromboembolism. Potential medicine interactions in patients with COVID-19 associated

with CVD have also become a serious concern.^[51] Therefore, it is necessary to conduct studies in this field.

After priority setting, it is necessary to anticipate financial resources and policies for their implementation. It was achieved by submitting a report to the Vice-Chancellor for Research of the MOH and uploading the research priorities in the NIMAD website.

Although this study was the first project to prioritize research in the cardiovascular area in Iran that used an innovative, indigenous, and standard approach, it also had some limitations. In this study, an attempt was made to participate with experts from different related fields in the country and at different levels of decision-making. All subjects were employees of the country's health system at different levels who had similar views. Therefore, participating with experts and decision-makers outside the health system and using the opinions of patients and the general public can be effective in providing more accurate results of the prioritization process. It is also suggested that a study be conducted to determine effective factors in selecting research criteria and topics by the expert's panel.

CONCLUSION

Considering the high burden of CVD in Iran, determining research priorities in the cardiovascular field using a standard and indigenous scientific model is essential for efficient use of limited resources and according to the social, economic, and cultural structure of society and the facilities and infrastructure of the health system. The indigenous approach designed and implemented in this research is based on scientific evidence, applicable and acceptable by clinicians, researchers and health policy makers.

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Conflicts of interest

There are no conflicts of interest.

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APPENDICES

Appendix No. 1) Research criteria (Indexes) Weighting Questionnaire

Which of the following main criteria, which influence the selection of the most important cardiovascular research priorities, is more important? and to what extent?

Criterion A	9	7	5	3	1	3	5	7	9	Criterion B
Importance	9	7	5	3	1	3	5	7	9	Cost effectiveness
Importance	9	7	5	3	1	3	5	7	9	Alignment with national and international priorities
Importance	9	7	5	3	1	3	5	7	9	Feasibility
Importance	9	7	5	3	1	3	5	7	9	Health equity
Importance	9	7	5	3	1	3	5	7	9	Acceptability in the community
Importance	9	7	5	3	1		5	3	9	Potential of subject to improving the quality of care and the consequences of the disease
Cost effectiveness	9	7	5	3	1	3	5	7	9	Alignment with national, regional and international priorities
Cost effectiveness	9	7	5	3	1	3	5	7	9	Feasibility
Cost effectiveness	9	7	5	3	1	3	5	7	9	Health equity
Cost effectiveness	9	7	5	3	1	3	5	7	9	Acceptability in the community
Cost effectiveness	9	7	5	3	1	3	5	7	9	Potential of subject to improving the quality of care and the consequences of the disease
Alignment with national and international priorities	9	7	5	3	1	3	5	7	9	Feasibility

Alignment with national and international priorities	9	7	5	3	1	3	5	7	9	Health equity
Alignment with national and international priorities	9	7	5	3	1	3	5	7	9	Acceptability in the community
Alignment with national and international priorities	9	7	5	3	1	3	5	7	9	Potential of subject to improving the quality of care and the consequences of the disease
Feasibility	9	7	5	3	1	3	5	7	9	Health equity
Feasibility	9	7	5	3	1	3	5	7	9	Acceptability in the community
Feasibility	9	7	5	3	1	3	5	7	9	Potential of subject to improving the quality of care and the consequences of the disease
Health equity	9	7	5	3	1	3	5	7	9	Acceptability in the community
Health equity	9	7	5	3	1	3	5	7	9	Potential of subject to improving the quality of care and the consequences of the disease
Acceptability in community	9	7	5	3	1	3	5	7	9	Potential of subject to improving the quality of care and the consequences of the disease