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Review Article

Iran Diabetes Research Roadmap (IDRR) Study; Research Gap in Gestational Diabetes in Iran: A Review Article

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Abstract

Background: Gestational diabetes mellitus has adverse effects on maternal and fetal outcomes during pregnancy and after delivery. The aim of this study was evaluation of the status of scientific research in gestational diabetes mellitus (GDM) in Iran.

Methods: This study is a part of the Iranian diabetes research roadmap (IDDR) project. We investigated the electronic database, including PubMed, Web of Science and Scopus as well as Scientific Information Database (SID), Indexing Articles Published in Iran Biomedical Journals (Iran Medex) and Iranian Magazine Database (Magiran) and extracted documents published by Iranian authors up to 2015. We also determined the subject area and the study design as well as the WHO and Australian National Health classifications.

Results: There were 229 relevant publications related to GDM. The most rapidly increasing trend in the publication was observed in two stages; 2007-2009 and then 2010-2013. The highest portion of the publications was clinical studies (74%). Regarding the study design, cross-sectional (32%), case-control (26%) and cohort (18%) studies were the most common types of studies. Regarding the subject, the most percentage of publications were allocated to fetal complications (46%) and the least were about prevention of GDM (1%).

Conclusion: The research about the GDM is non-coordinated and not effective and there is not any participated framework to guide the research related to GDM in Iran. Thus, it is critical to provide the roadmap for GDM studies to preserve time and money. This study identified and highlighted the research gap in GDM in Iran to provide a roadmap for the medical research of GDM.

Keywords: Research design, Research type, Gestational diabetes mellitus, Iran

Introduction

Gestational diabetes mellitus (GDM) is a metabolic aberration, defined as "any degree of glucose intolerance with onset or first recognition during pregnancy" (1). Gestational diabetes mellitus is a common metabolic condition that affects 2%–9% of all pregnancies (2). The worldwide

prevalence of hyperglycemia during pregnancy in women aged 20 to 49 yr was estimated to be16.9% or 21.4 million live births in 2013. The highest prevalence of GDM was reported in the South-East Asia Region (25.0%) and the least rate was in the North America and Caribbean Region (10.4%). More than 90% of GDM occurs in low- and middle-income countries where the trend is increasing (3).

The prevalence of GDM is increasing worldwide; it is estimated that GDM effects on the approximately 7% of all pregnancies (1 to 14%), depending on the studied population and on the used criteria for diagnosing of GDM, resulting in more than 200000 cases annually (4). The prevalence of GDM in Iran has been estimated at 3.4% ranged from 1.3% to 18.6% (5). Therefore, Iranian women are a particularly high-risk population.

GDM is frequently associated with short- and long-term health complications not only for the mothers, also for the fetus and neonates (6). Hyperglycemia during pregnancy increase the risk of developing postpartum type 2 diabetes mellitus (7), cesarean section, excessive weight gain and perinatal disease such as preterm labor, hydramnios, and hypertensive disturbances among mothers with GDM compared to women without a history of GDM (8, 9).

On the other hand, hyperinsulinemia and hyperglycemia in GDM predispose the developing fetus to macrosomia and intrauterine growth retardation (IUGR), neonatal hyperglycemia, and neurological disorders, developing diseases such as diabetes mellitus type 2, obesity, hypertension or gestational diabetes during its adult life (10-13).

The production of scientific literature, including the medical publications, has grown in Iran in terms of quantity in recent years (14-16). However, regardless of quality, the number of scientific papers published in Iran is still less than developed countries. A scientometric study was performed in GDM for comparison of educational growth within four different developing countries (17).

Regularly, clinical guidelines on the diagnosis and treatment of many chronic diseases, including GDM are developed and distributed each year at the national and international levels. Priorities in medical research are determined by considering numerous factors such as the current status and the future anticipated needs of the population. Therefore, by considering the multifactorial nature and burden of GDM, and their roles in public health and next generations, each country and region need to conduct the studies to provide their specific priorities in medical research (18).

The aim of this study was to evaluate status of scientific research output and knowledge gap in GDM in Iran. No study has been done in Iran to explore the status of medical research in GDM. Therefore, this study was performed to evaluate the qualitative and quantitative aspects of medical research in GDM in Iran.

Methods

This study is a part of the Iranian Diabetes Research Roadmap (IDRR) which covered all the types of articles conducted on the topic of diabetes mellitus by Iranian authors. We investigate the electronic database, including PubMed, Web of Science and Scopus to identify the relevant English-language articles using the keywords "Diabetes mellitus" and "Iran*" and their combination. We also searched the Persian (Farsi) language articles with Scientific Information Database (SID), Indexing Articles Published in Iran Biomedical Journals (IranMedex) and Iranian Magazine Database (Magiran). The time frame of our investigation covered the years from 1998 to 2015 (19).

After eliminating the unrelated articles and duplications, all assigned publications in our database were analyzed and then categorized with respect to the date of publication, WHO classification, Australian National Health classification, study design, and subject categories (20, 21).

All the selected documents were categorized based on the topic into eleven subgroups headings of complications, management, comorbidities, basic sciences, psychology, nutrition, exercise

and physical activity, genetics, education and gestational diabetes mellitus (GDM).

In all studies reviewed (19), 546 articles were relevant to gestational diabetes (GDM). All article titles and abstracts were reviewed and unrelated articles were discarded. Finally, 229 articles were sourced. The selected articles were classified as cross-sectional, case-control, cohort, randomized/non-randomized clinical trials, review, systematic review with /without meta-analysis, case-reports, cost-effective and animal studies. For the descriptive statistical analyses, we used the SPSS 17.00 software package (SPSS, Inc, Chicago, IL).

Results

The annual production of publications regarding the GDM by Iranian authors is demonstrated in Fig. 1. A general increasing trend in the number of publications related to GDM from 1998-2015 in Iran. The most rapidly increasing trend was observed in two stages; from 2007 to 2009 and then from 2010 to 2013.In addition, we observed several drop movement in the numbers of studies related to GDM in Iran during the years of 1999, 2002, 2004 and 2008.

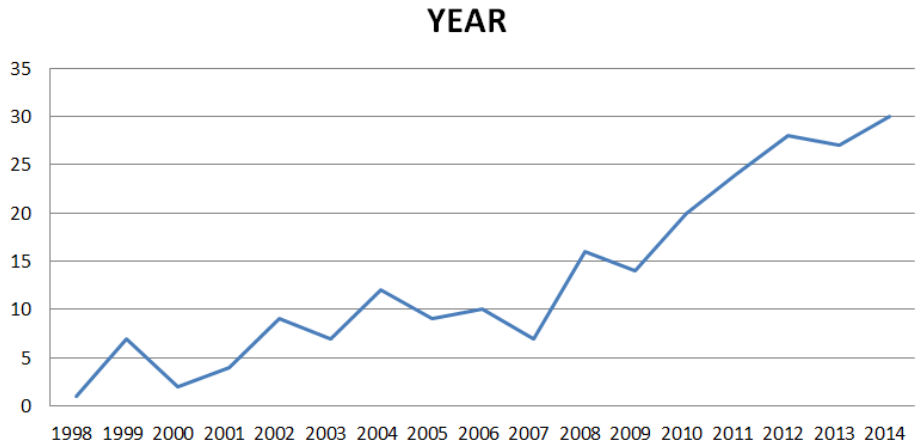

Fig. 1: Trend of studies related to GDM by Iranian researchers based on the year of publication

According to the WHO classification system, the number of publications regarding two groups, including the "prevalence and incidence" and "causes and determinants" of GDM composed 70% of total studies. The next most prevalent studies were included casereports, animal studies and systematic review studies (17%). The publications about the "strategies and intervention" and "evaluation of the intervention" in the field of GDM allocated the 10% and 3% of the total number of studies, respectively.

According to the Australian National Health and Medical Research Council method (AUS), the highest portion of the publications was clinical studies (74%). Other categories including public, basic and review studies are composed 11%, 10% and 5% of published studies, respectively.

Cross-sectional (32%), case-control (26%) and cohort (18%) studies were the most interesting types of publications in the field of GDM for Iranian authors during 1998-2015. On the other hand, we did not record any publication with nonrandomized clinical trial design among the obtained documents in this research (Fig. 2). Fig. 3 demonstrates the frequency of different topics of the studies related to the GDM from 1998 to 2015 by Iranian researchers. According to Fig. 3, the most interesting topic related to GDM for Iranian researchers was studies regarding the "fetal complications". On the other hand, performing the studies about the prevention of

GDM had the lowest attention among the Iranian researchers.

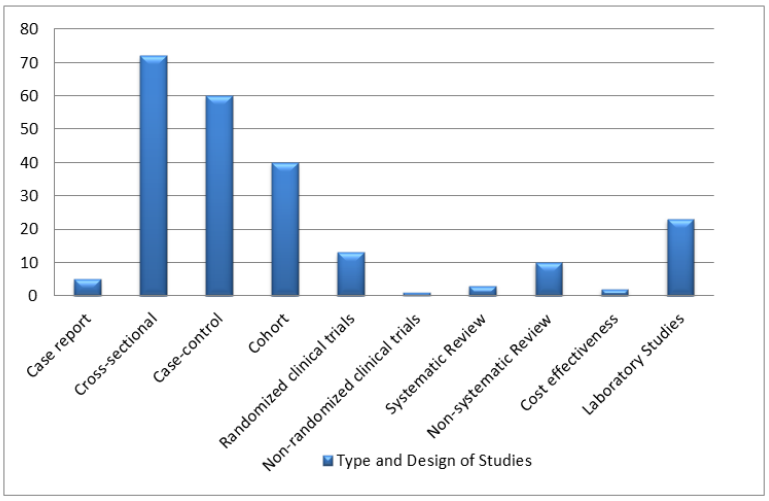

Fig. 2: The distribution of the GDM-related publications based on the type and design of the studies

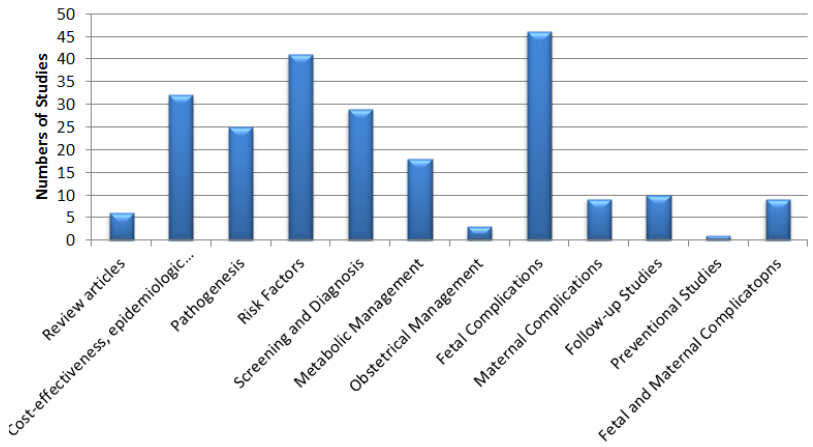

Fig. 3: Number of publications with the various subjects related to the GDM by Iranian authors (1998 to 2015)

Discussion

All published papers in GDM in Iranian and international journals by Iranian authors during 1998-2015 have been assessed. The number of scientific research conducted in Iran on various aspects of GDM has increased from 1998 to 2015 with a dramatic growth from 2009 onwards. During this nearly 17-year period, 229 researches have been published regarding GDM by Iranian authors.

In the article published recently entitled "global architecture of gestational diabetes research", five leading countries in the research related to GDM were introduced based on their publications during 1900–2012 (22). The United States of America, England, Australia, Canada, and Italy are the most advanced countries experiencing the fastest growth rates of research in GDM. Eyes have been in the USA, at the top of the list, publishing 4295 papers and Sri Lanka with 13 papers at the end of this list. In this paper, Iran has been ranked among the countries with more than 100 scientific papers in GDM. In general, many Asian countries such as Russia, China, and countries of South American were reported to have very little

scientific production in the field of GDM during this period (22).

Shakiba, et al performed a study for comparison of educational growth within four different developing countries, including Brazil, South America, Iran in the Middle East, Turkey in Europe, and Malaysia in Asia. Based on the all factors consisting of the number of publications, citations, citations per document, the number of doctoral degrees, and the number of academic staff, Brazil is found in the top rank and Malaysia is last. Iran was in the third position after the Turkey (17). From the point of view of the knowledge translation, the ultimate goal of conducting scientific research and publishing papers in the medical field is to make a progress in the prevention, control, and treatment of various diseases.

In our recent study, proportion of GDM studies in Iran was in concordance with the world GDM publications (23).

In general, many factors contribute to the development of scientific productions in Iran, including the growing number of universities and research centers, human resource development, as a researcher, providing better financial support for scientific research, development of new fields in medicine and health-related sciences. Other mentioned factors were the increasing number of scientific journals in Iran in various fields of medicine, increasing the influence of scientific research on policy making system in health related issues, and increased awareness of society for the health-related issues in Iran (24).

Using a quantitative assessment of scientific papers is a traditional method to evaluate scientific production. Today, we know that besides the number of papers, other factors such as the quality of papers are important in the evaluation of scientific production, evaluated according to the type and design of the article, its position in the hierarchy of scientific evidence, the number of citations and etc.

However, several other factors such as the number of universities and research institutions, the percentage of the total health budget of a nation spent on health-related research, and also the number of human recourses and researchers working in research centers should be considered while evaluating the research status of a country.

Although, the citation and H-index of the Iran's publication output in GDM are not elucidated in this paper, the H-index of Iranian-published papers in GDM in the group of H-index ≥ 20, according to the global categorization. USA dominated the highest score of H-index (H-index=125) of research related to GDM (22).

Thus, exclusive focus on the number of scientific publications for promoting the indexes of universities, research centers, and authors result in a negative effect on the scientific productivity by conducting non-integrated and low-quality investigations. On the other hand, these publications have no variable roles in knowledge translation and can't meet the needs of the health system.

Based on the WHO classification, GDM studies should be focused on providing strategies and interventions for prevention and management of GDM and evaluation of these interventions such as HSR studies. The coordinated and integrated researches provide a better basis for performing the more effective and efficient researches according to the community needs, financial possibilities, and potential of researchers to develop more effective ways to address health issues.

Considering the nature of the disease, short period of pregnancy and fetal-maternal complications of GDM, as we expected most of reviewed studies were in clinical category in the Australian National Health classification.

The most of the medical researches related to the GDM in Iran are allocated to the cross-sectional, case-control, and cohort studies, respectively. In addition, the randomized and non-randomized clinical trials, systematic and non-systematic review studies were ≤10% of total published papers in Iran. Only 10 non-systematic review and 3 systematic review studies were conducted with the topic of GDM in Iran during recent 17- year period. One systematic review and meta-analysis entitled "prevalence of diabetes mellitus in Iran" was published in 2000 in Iran (25).

The results of our study are consistent with the previously published studies exploring the scientometry of Iranian scientific productions in med-

ical sciences. The evaluation of the scientometric index of 7 leading medical universities in Iran, were confirmed the low number of systematic review studies compared to other types of scientific products (2.5%-3.9%) (26). This finding was approved by another study investigating the scientific production rate of Islamic countries, including Iran, in 2002-2009(15). The systematic review studies are considered at the highest level of the scientific evidence pyramid. The reason behind the extreme importance of systematic review studies is that the results of these studies play a unique role in updating the medical knowledge of physicians and medical experts rather than other types of papers. Besides, the results of systematic review studies provide an important and reliable criterion for health policy-making and development of guidelines in medical sciences (27). However, interventional clinical studies and cross-sectional studies such as case-control ones are the substructures of systematic review studies.

In addition, observational and descriptive studies are important because they provide valuable information about the patterns of disease occurrence in populations, particularly in relation to person, place, and time. Therefore, these studies provide information about correlations among variables and not about causal relationships. Therefore, descriptive studies are the first step to a better understanding of health-related problem in a specific population for designing and performing more investigations (28). In the entire world and in all fields of medicine; researchers are mostly interested to conduct descriptive studies, case-control studies, and clinical trials rather than cohort studies. This is because the case-control studies and clinical trials are carried out in a shorter time and at lower costs in comparison with the cohort studies. Future studies should be focused on studies with higher levels of evidence, including cohorts, systematic reviews and meta-analysis.

While the lowest percentage of researches were performed in studies with the subject of "prevention of GDM" (0.43%), a significantly higher percentage of studies were done with the subject of "fetal complications" (20.08%) followed by the studies related to risk factors (17.9%) of GDM and then cost-effectiveness and epidemiological studies (13.9%). While, the global roadmap of GDM reported an increasing trend in the areas " Endocrinology& metabolism" and " obstetrics & gynecology" in the period of 1963-1967, we observed that "Metabolic Management" and "Obstetrical Management" included the lower percentage of publications compared to the other subjects such as "Fetal Complications" among Iranian researchers. By considering the importance of the prevention instead of treatment of disease, our data show the lack of integrity and consistency in the studies, performed in various aspects of GDM in Iran during this period. Due to the short duration of this condition, importance of prevention of the disease and also prevention of short- and long-term health complications in mother and their children, even in later life, future researchers should be focused on developing effective interventions and strategies, evaluation and implementation of these interventions to prevent and reduce the incidence of GDM as well as its maternal and fetal complications.

Conclusion

Studies with a higher level of evidence should be performed for providing national and regional guidelines to promote our health system services in GDM. Our future researches should be directed toward integration of basic and clinical sciences and personalized medicine in concordance with the world. Thus, it will be critical to providing the road map to guide the researchers to conduct further investigation and to facilitate funding in the medical researches related to GDM. The results of our study can be applied for, providing a road map in the medical research of GDM.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission,

redundancy, etc.) have been completely observed by the authors.

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References

1. Metzger BE, Coustan DR, Committee O (1998). Summary and recommendations of the fourth international workshop-conference on gestational diabetes mellitus. *Diabetes Care,* 21 Suppl 2:B161-7.
2. Crowther C, Hiller J, Moss J, McPhee A, Jeffries W, Robinson J (2005). Australian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS) Trial Group. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. *N Engl J Med,* 352:2477-2486.
3. Guariguata L, Linnenkamp U, Beagley J, Whiting D, Cho N (2014). Global estimates of the prevalence of hyperglycaemia in pregnancy. *Diabetes Res Clin Pract,* 103:176-85.
4. American Diabetes Association (2014). Diagnosis and classification of diabetes mellitus. *Diabetes care,* 37(Suppl 1): S81-S90
5. Jafari-Shobeiri M, Ghojazadeh M, Azami-Aghdash S, Naghavi-Behzad M, Piri R, Pourali-Akbar Y, Nasrollah-Zadeh R, Bayat-Khajeh P, Mohammadi M (2015). Prevalence and Risk Factors of Gestational Diabetes in Iran: A Systematic Review and Meta-Analysis. *Iran J Public Health,* 44:1036-44.
6. Bener A, Saleh NM, Al-Hamaq A (2011). Prevalence of gestational diabetes and associated maternal and neonatal complications in a fast-developing community: global comparisons. *Int J Womens Health,* 3:367-73.
7. Bellamy L, Casas J-P, Hingorani AD, Williams D (2009). Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. *Lancet,* 373:1773-9.
8. Association AD (2012). Diagnosis and classification of diabetes mellitus. *Diabetes Care,* 35(Suppl 1):S64-S71.
9. Catalano PM, McIntyre HD, Cruickshank JK, McCance DR, Dyer AR, Metzger BE, Lowe LP, Trimble ER, Coustan DR, Hadden DR (2012). The Hyperglycemia and Adverse Pregnancy Outcome Study Associations of GDM and obesity with pregnancy outcomes. *Diabetes Care,* 35:780-6.
10. Xiong X, Saunders L, Wang F, Demianczuk N (2001). Gestational diabetes mellitus: prevalence, risk factors, maternal and infant outcomes. *Int J Gynecol Obstet,* 75:221-8.
11. Gillman MW, Rifas-Shiman S, Berkey CS, Field AE, Colditz GA (2003). Maternal gestational diabetes, birth weight, and adolescent obesity. *Pediatrics,* 111:e221-6.
12. Wright CS, Rifas-Shiman SL, Rich-Edwards JW, Taveras EM, Gillman MW, Oken E (2009). Intrauterine exposure to gestational diabetes, child adiposity, and blood pressure. *Am J Hypertens,* 22:215-20.
13. Baptiste-Roberts K, Nicholson WK, Wang N-Y, Brancati FL (2012). Gestational diabetes and subsequent growth patterns of offspring: the National Collaborative Perinatal Project. *Matern Child Health J,* 16:125-132.
14. Eskrootchi R, Hassanzadeh H, Gohari M, Jamshidi R (2009). Trend of Iranians' Scientific Papers in Medical Fields in 1978-2007. *J Health Administration,* 12:29-38. (In Persian)
15. Habibi E, Mirhosseini Z, Majidi M (2010). Medical publications (2002-2009) of Islamic countries; A Medline-based study compared to non-Islamic countries. *Iran J Med Sci,* 35:226-235.
16. Aminpour F, Kabiri P (2009). Science production in Iran: the scenario of Iranian medical journals. *J Res Med Sci,* 14:313-322.
17. Shakiba M, Ale Ebrahim N, Danaee M, Bakhtiyari K, Sundararajan E (2016). A Comprehensive Comparison of Educational Growth within Four Different Developing Countries between 1990 and 2012. *Revista de Gestão e Secretariado,* 6:152-174.
18. Nasli-Esfahani E, Peimani M, Rambod C, Omidvar M, Larijani B (2014). Developing a Clinical Diabetes Guideline in Diabetes Research Network in Iran. *Iran J Public Health,* 43:713-21.

19. Shafiee G, Nasli-Esfahani E, Bandarian F, Peimani M, Yazdizadeh B, Razi F, Farzadfar F, Larijani B (2016). Iran Diabetes Research Roadmap (IDRR):The study Protocol. *J Dibetes Metab Disord.,* 15:58.
20. World Health Report (2012). No health without research. Geneva. http://collections.plos.org/world-health-report
21. Australian Standard Research Classifications (ANZSRC) and NHMRC Research Keywords and Phrases 2008 edition. https://www.nhmrc.gov.au/grants-funding/policy/australian-standard-research-classifications-and-nhmrc-research-keywords-and-p
22. Brüggmann D, Richter T, Klingelhöfer D, Gerber A, Bundschuh M, Jaque J, Groneberg DA (2016). Global architecture of gestational diabetes research: density-equalizing mapping studies and gender analysis. *Nutr J,* 15:36.
23. Nasli-Esfahani E, Farzadfar F, Kouhnavard M et al (2017). Iran Diabetes Research Roadmap (IDRR) study: A preliminary study on diabetes research in the world and Iran. *J Diabetes Metab Disord,* 16:9
24. Moin M, Mahmoudi M, Rezaei N (2005). Scientific output of Iran at the threshold of the 21st century. *Scientometrics,* 62:239-248.
25. Larijani B, Abolhasani F, Mohajeri-Tehrani MR, Tabtabaie O (2005). Prevalence of diabetes mellitus in Iran in 2000. *Iran J Diabetes Metab,* 4:75-83.
26. Fakhree M, Abolghassemi A, Jouyban A (2011). Scientometric analysis of the major Iranian medical universities. *Scientometrics,* 87:205-220.
27. Langer L, Stewart R (2014). What have we learned from the application of systematic review methodology in international development?–a thematic overview. *J Dev Effect,* 6:236-248.
28. Grimes DA, Schulz KF (2002). Descriptive studies: what they can and cannot do. *Lancet,* 359:145-149.