*Iranian J Publ Health, Vol. 38, Suppl. 1, 2009, pp.115-118*
*A supplementary Issue on:*
*Iran's Achievements in Health, Three Decades after the Islamic Revolution*

# Progress of Education, Research and Services in Medical Genetics, in Some Institutions of Iran

*DD Farhud [1, 2], AS Lotfi [3], M Hashemzadeh Chaleshtori [4], M Akhondi[5], H Sadighi [2]

[1] School of Public Health, Tehran Univ. of Medical Sciences, Iran
[2] Genetic Clinic, Vallie Asr Sq, Tehran, Iran
[3] National Institute of Genetic Engineering and Biotechnology (NIGEB), Iran
[4] Cellular and Molecular Research Center, Shahrekord Univ. of Medical Sciences, Iran
[5] Avicenna Research Institute, Shahid Beheshti Univ. Evin, Tehran, Iran

**Abstract**
The present paper is a review of progress and major activities in education, research, services and ethics in the field of medical genetics in some centers in Iran. National projects of population genetics, genetic epidemiology, like national human genome projects, Connexin 26 and Pejvakin, distribution of thalassemia, hemophilia, etc in different ethnic groups, and religious minorities of Iran, are mentioned.

**Keywords:** *Education, Research, Services, Ethics, Medical genetics, Iran*

## Introduction

In the sixties (1960-1970) in Iran, education and some research in genetics were carried out in primary stages, in three branches of human and medical genetics, animal genetics and plant genetics. Medical and human genetics were at the level of observations, case- and clinical reports. Animal genetics were followed as basic research on *Drosophila* and plant genetics were at a similar level. Five national congresses were held in Tehran, Isfahan, Tabriz, Ahwaz and Mashhad to present the results of the research, with Iranian participants from the fields of medicine, animal biology and botany, and some foreign invited lecturers.

No institution or department existed to lead and coordinate the related education and research; the courses were limited to only few credit hours in various faculties.

In 1972, the first Department of Human Genetics and Anthropology was founded in the School of Public Health, at the University of Tehran, by D D Farhud.

No doubt, eight years of war and defending the country, and later the period of reconstruction, have had tremendous effects on the progress and distribution of education, research, and services in different areas of genetics in Iran. Since about 20 yr ago, with the tranquility of the country, together with development in all scientific and technological fields, medical genetics has also had good acceleration in progress.

### *Education*

Originally, master (Msc) courses in human genetics (1990) were established, followed by PhD courses in medical genetics (1999) at the Department of Human Genetics and Anthropology, School of Public Health, Tehran University of Medical Sciences. From 2003, master and PhD courses continued at the Department of Medical Genetics, School of Medicine. Gradually, preparations were made at the other institutions and universities in Tehran, such as Pasteur Institute, National Institute of Genetic Engineering and Biotechnology, Universities of Shahid Beheshti, Tavanbakhshi (Rehabilitation), Tarbiat Modarress, Azad Esslami; later, the provincial universities followed as suit. In this manner, the second generation of genetic specialists became active in Iran, added to them, were graduated Iranian geneticists (PhD) from other countries returning to Iran to serve the country.





*Corresponding author: Tel: +98 21 88950184

***Research***

Research was carried out on population genetics and genetic epidemiology, prevalence and distribution of blood groups, serum proteins, red cell enzymes (1-4), prevalent disorders such as alpha and beta thalassemia, hemophilia, G6PD deficiency (Favism), PKU, etc (5-8); even anthropological characteristics, like weight and height, head and chest circumferences, menarche and menopause age (9-11), eye color, hair type and color, nose shape, etc in various populations, races, ethnic and religious groups (Moslems, minorities of Zoroastrians, Christians- Armenians and Assyrians– and Jews) were studied in Iran. As such, the genetic fitures of ethnic, racial and religious minorities in Iran, were investigated and registered in all provinces.

In the nineties, university departments and centers affiliated to them were organized rapidly. Some, like Center for Genetic Research and Biotechnology, Pasteur Institute, University of Tavanbakhshi (Rehabilitation) has had higher speed and valuable services in providing human resources specialized in medical genetics, carrying out related research and providing some services to patients.

National Institute of Genetic Engineering and Biotechnology (NIGEB) started in the early nineties affiliated to the Ministry of Sciences, Research and Technology. The major missions are promoting research and higher education in the field of advanced molecular biology and biotechnology, applied research, technology development and technology transfer, technology marketing and protecting the intellectual properties rights. Activities are in plant, animal, and industrial biotechnology, research on diagnostic methods for human genetic diseases, human stem cell, stem cell and tissue engineering, bioremediation, metabolic engineering (12, 13).

Avicenna Research Institute (ARI) was founded in 1998, with the mission in the field of biology, reproductive biotechnology and infertility, consisting three research centers of Reproductive Biotechnology Research Center (RBRC), Monoclonal Antibody Research Center (MARC) and Nanobiotechnology Research Center (NBRC). ARI has made achievements in technology of antibody production and has used it in research and diagnosis, particularly in cancer immunology and immunotherapy. The Avicenna Infertility Clinic has made progress in basic and clinical fields such as immunology, genetics, embryology, obstetrics and gynecology, urology, endocrinology. Reproductive Genetics & Biotechnology Department has kept up with the rapid developments of genetic engineering and biotechnology in prevention, diagnosis and treatment of diseases. Transgenic technology, cloning, PGD, cell gene therapy are among the new applied techniques.

Renowned and well established centers such as Rouyan Research Institute, established in early nineties, by the late S. Kazemi-Ashtiani, carry out research and provide services in infertility, IVF and stem cell, at highly recognized national, regional and in some respect world levels specially in animal cloning.

Another well known center for reproductive biology and infertility is affiliated to Yazd University of Medical Sciences (established and supervised by A Aflatonian) provides services at national and regional levels, with foreign referrals.

National Human Genome Diversity Project of Iran (HGDPI), was started in the nineties (supervised by MH Sanati) and carried out by the scientists at the National Institute for Genetic Engineering and Biotechnology and collaborations of other scientists from different universities and research centers. HGDPI has attempted to collect blood samples, prepare and maintain the cell line and map the DNA that varies among 18 Iranian ethnic populations. The main goal of the HGD project lies in its enormous potential in illuminating our understanding of the origin, identity and history of populations living in Iran. The resources created by the HGD project will also provide valuable information on the role played by genetic factors in the predisposition, linkage or resistance to disease. So far the samples have been

collected and most part of the experimental work has been done and the results published. The final results showing the outcome of the project are under preparation.

National research project on determination of Connexin 26 and Pejvakin (supervised by M Hashemzadeh and D D Farhud) was carried out on different ethnic groups in 11 provinces of Iran. Frequency and type of the GJB2 and DFNB59 gene mutations and frequency of the common GJB2 mutation 35delG were determined (14, 15). It was shown that 71% of the children with deafness were offsprings of consanguineous marriages.

***Services***

About 1990, prenatal diagnosis of Thalassemia was made possible for the first time in Iran, followed by the same procedure for other genetic disorders such as Hemophilia, Duchene Muscular Dystrophy, Cystic Fibrosis, Spinal Muscular Atrophy, etc. Finding various mutations of these disorders were made available with geographical and ethnic distributions, making molecular population genetics possible in Iran.

Nowadays, prenatal diagnosis is possible for most genetic disorders, with carrier detection; particularly those prevalent in Iran and molecular forensic medicine has been taken care of extensively.

Many research projects have been carried out so far, between different research centers of Iran and foreign universities and institutions. Treatments with stem cell have been made in various fields of Oncology, Ophthalmology, Cardiology, etc. IVF, PGD have been used successfully in prevention of genetic disorders. Other active research centers in different fields, such as Endocrinology, Gastroenterology, Ophthalmology, Cardiology, Cancer, Infertility, etc have good mutual scientific relationship with the genetic centers in the country.

***Private services***

The first private Genetic Clinic was established in Tehran in 1975, with an archive of, up to now, nearly 60,000 family genetic records. Many referrals from neighboring countries come to Iran for genetic counseling, carrier detections, prenatal diagnosis of genetic disorders, IVF, PGD, etc.

Presently there are many centers for genetic counseling and laboratory services in each province of Iran

***Ethics in Medical Genetics***

Activities in the area of Ethics in Medical Genetics have been started at international and national level in Iran since 1995(16-22). Extension and establishing of ethical codes in medical genetics and other medical fields have grown very rapidly so far, by many authors from different centers of Iran.

## Acknowledgements

The authors acknowledge efforts of all authorities and scientists, in the past and present, active in the branches of Medical Genetics in Iran. We apologize to those who are active in the field but their names and good works have not been mentioned in this paper.

## References

1. Fahud DD, Ananthakrishnan R, Walter H (1972). Association between C3 phenotypes and various diseases. *Humangenetik*, 17(1): 57-60.
2. Fahud DD, Ananthakrishnan R, Walter H, Loser J (1973). Electrophoretic investigation of some red cell enzymes in Iran. *Hum Hered*, 23(3): 263-66.
3. Farhud DD, Amirshahi P, Hedayat SH (1979). The distribution of haptoglobin type in Bandarabas. *Iranian J Publ Health*, 7: 181-82.
4. Fahud DD (1980). Haptoglobin polymorphism in the Middle East. *Jinrui Idengaku Zasshi,* 25(3): 203-6.
5. Hedayat SH, Farhud DD, Montazami K, Ghadiryan P (1981). The Pattern of Bean Consumption, Laboratory Findings in Patients with Favism, G-6-P-D Deficient, and a Control Group. *J Trop Pediatr*, 27: 110-13.

6. Fahud DD, Kabiri M (1982). Incidence of phenylketonuria (PKU) in Iran. *Indian J Pediatr*, 49(400):685-8.
7. Farhud DD (1987). ABO and RH Blood Group Distribution in Hemophilia and Anti HIV Positive Individuals. *Iranian J Publ Health*, 16(1-4):1-
8. Farhud DD, Yazdanpanah L (2008). Glucose-6-phosphate dehydrogenase (G6PD) Deficiency. *Iranian J Publ Health*, 37(4): 1-18.
9. Fahud DD, Kamali MS, Marzban M (1986). Annuality of Birth, delivery types and sex ratio in Tehran, Iran. *Anthropol Anz*, 44(2):137-41.
10. Farhud DD, Walizadeh GhR, Kamali MS (1986). Congential malformations and genetic disease in Iranian infants. *Hum Genetics*, 74(4): 382-85.
11. Farhud DD, Aghasi M, Sadighi H (2008). Gene and Aging. *Iranian J Publ Health*, 37(3):1-8.
12. Hasannia S, Lotfi AS, Mahboudi F, Rezai A, Rahbarizadeh F, Mohsenifar A (2006). Elevated Expression of Human Alpha-1 Antitrypsin Mediated by Yeast Intron in *Pichia pastoris. Biotechnology Letter J*, 28:1545-50.
13. Noghbi AK, S Zahiri H, Lotfi AS, RashebJ, Nasri S, Yoon S (2007). Mercury absorption by pseudomonas fluorescens BM07 grown at two different temperatures. *Polsh J of Microbiology*, 56(2):111-117.
14. Hashemzadeh Chaleshtori M, DD Farhud, MA Patton (2007). Familial and Sporadic GJB2-Related Deafness in Iran: Review of Gene Mutations. *Iranian J Publ Health*, 36(1):1-14.
15. Hashemzadeh Chaleshtori M, Hoghooghi Rad L, Dolati M, Sasanfar R, Hoseinipour A, Montazer Zohour M, Pourjafari H, Tolooi A, Ghadami M, Farhud DD, Patton MA (2005). Frequencies of Mutations in the Connexin 26 Gene (GJB2) in Two Populations of Iran (Tehran and Tabriz), 34(1):1-7.
16. WHO (1995). Guidelines on Ethical Issues in Medical Genetics and the Provision of Genetic Services (Farhud as a Committee member) (Blue Book) (WHO/ HDP/GL/ETH/9501).
17. WHO (1996). Control of Hereditary Diseases. Report of a WHO Scientific Group. Geneva, Technical Report Series No. 865. (Farhud as a Committee member).
18. WHO (1998). Proposed International Guidelines on Ethical Issues in Medical Genetics and Genetic Services (Farhud as a Committee member) (White Book) (WHO/HGP/ETH/98.1).
19. Farhud DD, Nikzat N, Mahmoudi M (1999). Views of Group of Physicians, Nurses and Midwives on Ethical Principles in Medical Genetics, in Iran. *Iranian J Publ Health*, 28:1-4.
20. WHO (1999). Services for the Prevention and Management of Genetic Disorders and Birth Defects in Developing Countries (Farhud as a Committee member) (WHO/HGN/WAOPBD/99.1).
21. WHO (2001). Review of Ethical Issues in Medical Genetics. (Farhud as a Committee member) (WHO/HGN/ETH/ 00.4).
22. WHO (2002). Collaboration in Medical Genetics, Report of a WHO Meeting, Toronto, Canada, 9.10 April 2002. (Farhud as a Committee member), (WHO/ HGN/WG/02.2).