

## Mental Retardation due to Down Syndrome and Other Causes in Referrals to Genetic Counseling Center in South of IRAN

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### ABSTRACT

**Introduction:** Mental retardation, is one of the most common causes for referral to genetic counseling centers, and is one of the greatest challenges in health care services in the world. Down syndrome is the most common chromosomal abnormalities in humans.

**Methods:** This study performed in Medical Genetic Counseling Center of Welfare Organization in south of Iran with high consanguineous marriages with aim of comparison between mental retarded children due to Down Syndrome and other causes of mental retardation between 2006-2014. Participants were 44 children with Down Syndrome and 71 mental retarded children due to another causes.

**Results:** The prevalence of mental retardation was 4.2% and the most common cause of mental retardation was Down Syndrome (38.2%). There was a significant statistical association between Down Syndrome and congenital heart defects ( $P=0.001$ ).

**Conclusion:** First and second trimester prenatal screening could help to detect pregnancies with increased risk of fetal chromosomal anomalies.

**Key words:** Mental Retardation, Down Syndrome, Genetic Counseling

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## Introduction:

Intellectual disability (ID)/mental retardation, with a prevalence of 1–3%, is one of the most common causes for referral to genetic counseling centers, and is one of the greatest challenges in health care services in the world (1). Intellectual disability is known by significant limitations in both intellectual function and adaptive behavior that begins prior to 18 years (2). Down syndrome (DS), also known as trisomy 21, occurs in about 1 in 700 births (3) and is the most common cause of mental retardation in humans (4) and the most common chromosomal abnormalities (5). Although DS leads to chronic developmental delays and other problems, it is mostly associated with impaired speech, hearing loss, and vision capabilities. In addition, most people with this syndrome have impaired cognitive ability and around half of them have a congenital heart defect (CHD) (3).

The risk factors associated with the birth of a child with DS are ambiguous. Approximately, 90 percent of the total incidence of DS is because of the free trisomy due to nondisjunction of chromosome 21 at oogenesis (6-8). A greater risk in the female parent is probably due to the manner the oocytes develop and progress toward maturity. DS is caused by an error in cell division which is called nondisjunction, usually in formation of one of the gametes (egg or sperm), where a sperm or egg cell remains with an extra chromosome 21 before or at conception. This non-disjunction may occur in the first or second stage of meiosis. Patau and Edwards syndromes are caused by nondisjunction during meiosis, which leads to an extra copy of chromosome in egg or sperm.

It should also be mentioned that advanced maternal age is the only established risk factor which may leads to the increased risk of all three trisomies in the offspring (9).

The overall maternal risk for Down syndrome births is obviously multifactorial which includes both genetic and environmental factors (6-8). High maternal age is a known risk factor for DS. There are also several studies of a possible effect of paternal age, but no consistent clue for an association has been found (10). The aim of this study was to investigate mental retarded children due to down syndrome and another causes.

## Methods:

**Setting:** This study performed in Medical Genetic Counseling Center of Bandar Abbas in south of Iran with high consanguineous marriages with aim of comparison between mental retarded children due to down syndrome and another causes of mental retardation between 2006-2014.

**Subjects:** Participants were 115 mental retarded children, 44 with DS and 71 mental retarded children due to another causes. Participants were chosen among 2681 referrals to medical genetic counseling center.

**Data collection:** Through genetic counseling complete family history was taken, pedigree was drawn, and in cases that was suspected to chromosomal anomalies karyotyping was requested. In one group the diagnosis was DS and in second group children were diagnosed with other causes of mental retardation. All of DS cases referred for echocardiography.

The age of mental retarded children was below 16 years. A questionnaire was designed by researcher and variables like maternal age, paternal age, number of mental retarded children, age of affected children, history of mental retardation in siblings and family, familial relationship between parents and congenital heart defects in affected children were studied.

**Data analysis:** The study data was analyzed using software SPSS 23 using descriptive statistics, Fisher exact test and Chi square.

## Results:

The prevalence of mental retardation was 4.2% and the most common cause of mental retardation was DS (38.2%).

Mean age in DS children was  $3.02 \pm 2.14$  and  $7.82 \pm 4.65$  in another mental retarded children. Mean age of mothers in DS children was  $31.3 \pm 7.5$  and  $34.5 \pm 7.6$  in another group and paternal mean age was  $35.3182 \pm 8.2$  in DS group and  $40.2958 \pm$  in another group.

36.4% of parents in down group had consanguinity marriage and 63.3% had non consanguinity marriage. In second group 45.1% of parents had consanguinity and 54.9% didn't. Consanguinity between two groups was not statistically significant ( $P=0.357$ ). In DS group 9.1% of siblings of cases were affected to mental retardation and in second group 90.9% had an affected sibling. 34.1% of children with DS and

65/9% in second group had positive history of mental retardation in their family. In DS group 10 children (22.7%) and in another group 2 children 2.8% were affected to congenital heart defect. There was a significant statistical association

between DS and congenital heart defects ( $P=0.001$ ) (Table 1).

**Table 1: Comparison of consanguinity and congenital heart disease and family history in study groups**

		Down Syndrome group	Other group	Statistics	Degree of Freedom	P-value
<b>Consanguinity</b>	<b>Yes</b>	16 (36.4%)	34 (45.1%)	0.847***	1	0.357
	<b>No</b>	28 (63.6%)	39 (54.9%)			
<b>Another affected sibling</b>	<b>Yes</b>	4 (9.1%)	15 (21.1%)	2.853***	1	0.091
	<b>No</b>	40 (90.9%)	56 (78.9%)			
<b>Family history of mental retardation</b>	<b>Yes</b>	15 (34.1%)	15 (21.1%)	2.368***	1	0.124
	<b>No</b>	29 (65.9%)	56 (78.9%)			
<b>Congenital heart defect</b>	<b>Yes</b>	10 (22.7%)	2 (2.8%)	-	-	0.001***
	<b>No</b>	34 (77.3%)	69 (97.2%)			

\*\*\* Chi-Square test

\*\*\*\* Fisher exact test

### Conclusion:

In most developing countries an accelerating trend to non-communicable diseases is seen in recent years. In Iran due to high Consanguinity marriages congenital malformations and genetic disorders are important causes of morbidity and mortality in newborns. Prevalence of ID has been reported around 1-3% population in the world (2). In our study the prevalence of mental retardation was 4.2%. DS is the most common genetic cause for mental retardation. This syndrome is diagnosed in 1 per 650–1000 live births (11). In our study too, most common cause of mental retardation was DS (38.2%). Free trisomy due to nondisjunction of chromosome 21 at oogenesis accounts for approximately 90% of total cases of down syndrome (12). In our study all of the patients that were affected to DS had free trisomy of chromosome 21 in their Karyotyping. In Dawson *et al.* study in 2014 of the 2,552 children affected to DS, 31.7% (n=808) had isolated DS, 24.0% (n=612) had severe congenital heart defects and 36.3% (n=927) had non-severe congenital heart defects (3). In our study 22.7% of children with DS affected to congenital heart defects.

Although all of children affected to mental retardation could not be diagnosed through prenatal screening tests, but first and second trimester prenatal screening could help for

detecting pregnancies with increased risk of fetal chromosomal anomalies and referring them for amniocentesis and cytogenetic evaluation to find affected pregnancies and terminate them on time.

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