

Sociodemographic and anthropological profile of children with Down syndrome in Tlemcen's population from the northwestern Algeria: Comparative study in the Mediterranean scale.

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Abstract:

Down Syndrome (DS) is the most common chromosomal aberration in humans with an occurrence of 1/800 live births. There are nearly 80,000 trisomic 21 currently in Algeria. The aim of our study is to give a sociodemographic and anthropological profile of children with DS from Tlemcen. A retrospective study of 135 diagnosed DS children, who had a specific clinical features. These children are admitted in six psychoeducational centers for mentally unsound children - PMC – and the UMD association located in different regions of Tlemcen from 2011 to 2017. We collected data using a pre-established questionnaire for parents and

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referring to children's medical and administrative records. The mean DS age was 11.73 years, with a sex-ratio of 2.06. Parental consanguinity has been reported in 14.07% of cases. The mean maternal age at birth was 36.29 years. Advanced maternal age is one of several risk factors for giving birth to a child with SD. This syndrome remains the most chromosomal aberration in Tlemcen's population as for other world populations. However, to better understand the prediction of DS we should increase the number of sample analyzed with the study of other factors.

Keywords: Anthropology; Down syndrome; Scociodémography; Population of Tlemcen; Maternal age; Algeria.

1. INTRODUCTION

Genetic disorders and malformations constitute a real public health problem worldwide, given their importance as a cause of morbidity and mortality. They affect millions of families around the world. Nearly 5% of all pregnancies result in the birth of a child with a congenital malformation or genetic abnormality (Verma and Singh, 1989; Penchaszadeh, 1993a, b).

Down syndrome (DS) or trisomy 21 is the first chromosomal aberration described in humans (Down, 1866), characterized by the presence of three chromosome 21 copies (Lejeune *et al*, 1959). It is the most common case of chromosomal abnormality, and also the leading cause of congenital mental retardation associated with a particular physical appearance. The prevalence of DS ranged from 6.1 to 13.1 per 10 000 people (de Graaf *et al*, 2017). The etiology of DS remains unrecognized (Rousseau *et al*, 2010), but the best-known epidemiological characteristic is its strong association with advanced maternal age (Penrose, 1933), which has been established at about 1/1000 neonates in elderly women under of 30 years, 1/353 in women aged 35, but only in 1/35 newborns in women aged 45 (ACOG, 2007).

The incidence of DS has remained stable for several years, it is 1.45 per 1000, or 1 per 700 births (Abraham *et al*, 1969; Gardner and Sutherland, 2004; Kanamori *et al*, 2000). In Algeria, the number of children with Down Syndrome is about 80 000 children (ANIT, 2012), little data is available about epidemiology of DS in Algerian population. Given this scarcity of DS data in the populations of North-West Algeria, our work focuses on an epidemiological characterization of DS Tlemcen's population in extreme north-west Algeria. The aim of our work is to determine the epidemiological profile underlying the clinical characteristics of patients with SD in seven districts of Tlemcen [Figure 1], comparing our population with populations of Mediterranean scale. The endogamous population of Tlemcen selected for this study although it has the distinction of being very culturally enriched by various invasions, it has remained preserved and isolated by its rugged mountains and cliffs.

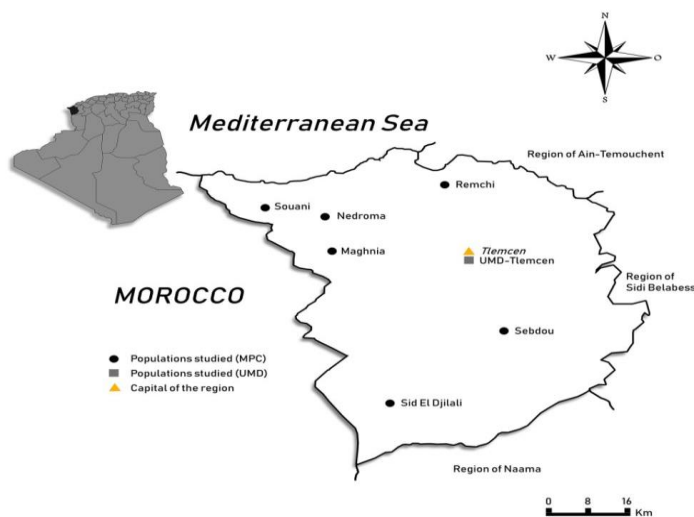


Figure 1. Map showing Tlemcen's region and the surrounding including the different study areas.

2. Patients and méthodes.

Ours tudy was carried out on 135 patients with DS (91males, 44 females), aged between 3 and 23 years old [Table 1], spread over seven centers in Tlemcen [Figure 1]. Tlemcen is located on the North-West Algerian coast, bordering on Morocco from the west, and occupying an area of 9,018 km² with a population of over 800 thousand inhabitants (ANIREF, 2017).

Patients are accommodated in psychoeducational centers for mentally unsound children (MPC) and the association Union of mentally handicapped Tlemcen (UMD), from 2011 to 2017. It is an epidemiological descriptive study. We collected data from patients' medical and administrative records on the first hand and from the other hand using a pre-established questionnaire for parents. Data include age, sex and patient's geographic origin, age of parents, parental consanguineous marriage, number of maternal miscarriages, and family history of DS or other mental pathology.

To process data, we calculated the means and standard deviations (SD) for quantitative variables and proportions (%) for qualitative variables.

3. Second Subtitle Ethical considerations.

To carry out this study, we had the consent following the rules of code of ethics.

Table 1. Frequency of subjects with DS in different centers of Tlemcen's region; their mean age and sex-ratio.

		Number	Age (years)	Sexe
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Study region	Center	of DS patients	Min	Max	Mean	Male	Female	Sex-Ratio
Tlemcen	UMD	13	6	23	11.46 ± 4.78	7	6	1.16 :1
Maghnia	MPC	41	4	23	11.58 ± 4.67	28	13	2.15 :1
Remchi	MPC	20	6	17	11.6 ± 3.4	16	4	4 :1
Sebdou	MPC	19	6	22	11.84 ± 4.94	9	10	1.1 :1
Souani	MPC	19	6	23	12.94 ± 5.39	15	4	3.75 :1
Nedrouma	MPC	13	6	19	11.07 ± 4.19	10	3	3.33 :1
Sid El Djilali	MPC	10	3	17	11.3 ± 5.96	6	4	1.5 :1
All regions	Total	135	3	23	11.73 ± 4.65	91	44	2.06 :1

4. RESULTS AND DISCUSSION

A total of 135 individuals with Down syndrome were included in this study (91 males and 44 females), with a sex ratio of 2.06: 1, among them 41 were from Maghnia, 29 from Sebdou and Sid El Djilali and 33 from Tlemcen and Remchi. The mean age of patients was 11.73 ± 4.65 years [Table 1]. About 75% of cases were the third birth or more. Parental consanguinity was reported in 14.07% of them. Two families had a family history for DS (less than 2%). In 17% of cases, women had abortions and / or miscarriages. The mean maternal age at indexed birth was 36.29 ± 5.90 years (min 21, max 50), for an average age of mothers at first birth of 23.60 ± 4.06 years (min 15, max 38) [Table 2, Figure 3].

Down syndrome is the most common and most recognizable birth defect of mental retardation. The diagnosis of Down syndrome, based on the clinical characteristics at neonatal period is usually done without difficulty, it has been reported from 73% to 100% (Fried, 1980; Devlin and Morrison, 2004). Data

reported in this study represent a demographic and anthropological descriptive profile of DS population from Tlemcen's region.

All cases were diagnosed postnatal based on clinical features, such as facial dysmorphism, flat face, small nose, small and abnormally shaped ears, single deep fold across the palmar center, developmental delay, difficult and / or absent speech and mental retardation.

The age of the patients ranged from 3 to 23 years, with an average of 11.73 years. This may indicate the age of schooling, because the study population came from psychopedagogical centers, and referral to these centers is possible only at the age of schooling which is 6 years in Algeria.

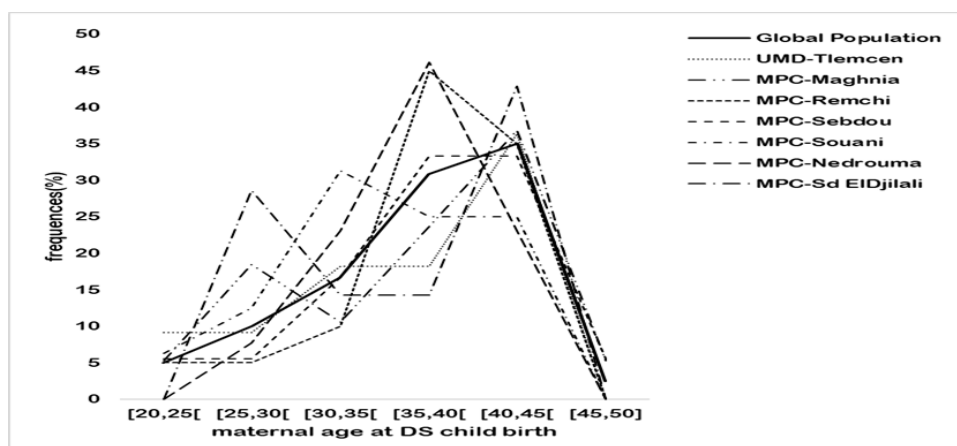


Figure 2. Prevalence of DS newborns according to maternal age at child birth.

In this study the mean sex ratio was 2.06: 1. Male predominance was reported in the major of study regions, with an inter-region's variability ranging from 1.1: 1 to 4: 1, also the sex ratio exceeding 2 in Four regions, and Sebdou's population made the difference by a sex ratio less than 1 [Table 1], this latter corroborated with the studies of Azman *et al* in Malaysia (Azman *et al*, 2007). However, in Mediterranean studies, the sex-ratio which varied from 1: 1 to

1.6: 1 (Chaabouni *et al*, 1999; Jaouad *et al*, 2010; El-Gilany *et al*, 2011; Demirham *et al*, 2015; Zahed and Megarbane, 1998; Real *et al*, 2015; Stoll *et al*, 1990; Carlo *et al*, 1990), remained inferior to our results, it was always in favor of males. Although the genetic mechanisms of male predominance are explained by models for the joint segregation of chromosome 21 and Y chromosome in chromosome spermatogenesis and non-disjunction during the second meiotic division of oogenesis caused by the spermatozoid Y chromosome (Ghosh *et al*, 2009). The reference model can influence the sex ratio because most of the studies were in a hospital setting as shown by Kovaleva in his meta-analysis on sex ratio in Down syndrome, which concluded that the sex ratio was skewed towards an excess of males in the majority of the populations studied, either in the population with a level of observation (epidemiological studies) or selected groups (Kovaleva, 2002).

Table 2. Demographic characteristics of Down syndrome patients.

Number of children	135
Age (years)	
Min	3
Max	23
Mean $\pm$ SD	11.73 $\pm$ 4.65
Sex	
Male	91
Female	44
Sex-ratio	2.06 :1
Birthorder	
First and second (%)	34 (25.18%)

Third and more (%)	101 (74,81%)
Maternalage of first birth (years)	
Min	15
Max	38
Mean $\pm$ SD	23.60 $\pm$ 4.06
Maternalage of DS child (years)	
Min	21
Max	50
Mean $\pm$ SD	36.29 $\pm$ 5.90
Consanguinity	
First Degree (%)	13 (9.63%)
Second Degree (%)	6 (4.44%)
Not consanguineous (%)	116 (85.93%)
Familyhistory	
History of DS (%)	2 (1.48%)
History of other mental health syndrome (%)	1 (0.74%)
number of abortions	
One abortion (%)	17 (12.59%)
Two and more (%)	6 (4.44%)
No abortions (%)	112 (82.96%)

The male predominance in the population of Tlemcen would be due to a socio-cultural bias, families would agree to send boys to these centers that girls, it is a problem of Traditions and custom.

About 14% of patients with Down Syndrome came from consanguineous marriages, with inter-regional variability ranging from 5.26% to 23.07%. A predominance of first degree consanguinity was reported [Table 5], which is similar to previous studies. in Algeria and Egypt who reported parental consanguinity in children with DS at 22.7% and 17% respectively (Boussouf *et al*, 2017; El-Gilany *et al*, 2011). Inbreeding in Tlemcen's regions appears to be common practice in urban and rural areas where the frequency of related marriages was 30.6% and 40.5% respectively (Zaoui and Biemont, 2002). Although consanguinity seems to be considered in Algeria as a public health problem, it was difficult in our study to determine the influence of genetic factors on the origin of pathology.

Table 5. Distribution of Down Syndrome's parental degree of consanguinity

Center	Number of Children	Consanguinity (%)		
		Total	1 st Degree	2 nd Degree
UMD-Tlemcen	13	15.38	100	00
MPC-Maghnia	41	17.07	71.43	28.57
MPC-Remchi	20	15	66.67	33.33
MPC-Sebdou	19	10.51	100	00
MPC-Souani	19	5.26	100	00
MPC-Nedrouma	13	23.07	100	00
MPC-Sid El Djilali	10	10	100	00
Total population	135	14.07	78.95	21.05

The birth order of children with Down syndrome ranged from 1 to 10,

Overall 81.8% of them were the third birth or more, and no recurrent trisomy was observed in our study population. These values were significantly higher than studies reported in Morocco and Egypt who shown that 50% of DS births come after two and healthier births (Jaouad *et al*, 2010; El-Gilany *et al*, 2011).

The mean maternal age at birth of children with Down syndrome was 36.27 ± 7.59 years (Min 21 years, Max 50 years). No inter-regional variability is reported [Table 6]. This result agrees with other studies in Algeria and Mediterranean Basin [Table 7]. The risk of having a child with Down syndrome increases with maternal age [figure], our data corroborate those published by the American Institute of Obstetricians and Gynecologists in its newsletter in 2007 (ACOG, 2007). Other studies suggest that this increased risk of DS was also due to increasing parity (Schimmel *et al*, 1997; Chan *et al*, 1998). Through missing data from the newborn register on annual maternal age, the risk for the DS was not evaluated in our study.

Table 6. Maternal age distribution of patients with Down syndrome.

Center	Number of Children	Maternal age of DS child (years)		
		Min	Max	Mean
UMD-Tlemcen	13	21	42	36.27 ± 6.9
MPC-Maghnia	41	21	50	36.1 ± 6.6
MPC-Remchi	20	24	44	37.55 ± 5.32
MPC-Sebdou	19	24	45	36.79 ± 5.78
MPC-Souani	19	24	44	35.0 ± 6.1
MPC-Nedrouma	13	27	42	36.30 ± 4.17
MPC-Sid El Djilali	10	28	42	35.57 ± 5.96
Total population	135	21	50	36.57 ± 5.90

The presence of a DS family history was reported in two families, less than 2%, they were non-first cousins of DS child for both cases.

Miscarriages and recurrent abortions (two or more abortions before the 1st trimester) accounted for less than 5% in all studied regions, which is not significant.

Table 7. Maternal age among mothers of Down syndrome > 35 years studied and pooled data from the Mediterranean scale.

Country	N° of DS	Mean maternal age	Maternal age > 35 years (%)	Reference
Currentstudy	135	36.57 ± 5.90	60.74	Hamdaoui <i>et al</i>
Algeria .	110	36.6	64.54	Boussouf, <i>et al.</i> 2017.
Southern				
Mediterranean	827	35.39	-	Jaouad, <i>et al.</i> 2010.
Morocco	500	32	36	Chaabouni, <i>et al.</i> 1999.
Tunisia	150	35.62	42.7	Verma, <i>et al.</i> 1990.
Libya	712	36.8 ± 5.2	-	El-Gilany, <i>et al.</i> 2011.
Egypt	280	32.19	41.5	Zahed, Megarbane.1998.
Lebanon				

Northern				
Mediterranean	600	39	61	Real, <i>et al.</i> 2015.
Spain	391	30.1	31	Stoll, 1990.
France	100	32	38	Palka, <i>et al.</i> 1990.
Italy	41	36.2	63.41	MALTA C A R.
Malta				

3. CONCLUSION

Advanced maternal age remains the major risk factor for giving birth to a Down syndrome child. This aberration of chromosome's number remains the most common in Tlemcen's the population like other world populations. Our results shown that the high risk of Down syndrome was due to advanced maternal age. A cytogenetic approach in addition to the classic phenotypic characteristics identifying the onset etiology of Down syndrome is imperative.

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