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Consanguineous marriages profile in the Tanger-Tetouan region in Morocco

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Abstract: *Consanguineous marriage has received a great deal of attention as a potential risk factor for many adverse health outcomes. More than a billion people in the world live in regions where 20%–50% of marriages are consanguineous. The aim of this study is to determine the frequency and types of consanguineous marriage in the region of Tanger-Tetouan in Northwest Morocco. Methods: A prospective study was conducted among a randomly selected sample of 160 university students in Tanger in 2014. All students were interviewed using a structured questionnaire. Results: The frequency of consanguineous marriages among parents of students was 39,4%, with a mean inbreeding coefficient (up to second cousins) of 0,02033. The study revealed a highly significant difference in the rates of the consanguineous marriages between the current and previous generation p< 0,001. The most common types of consanguineous marriage among current generationwere first cousin marriage, which accounts for 76,2% of all consanguineous unions, followed by first cousin once removed (11,1%) and second cousin marriage (3,2%), while 9,5% of marriages were between distant relatives. Among the previous generation, more than half of consanguineous marriages were between first cousins, whereas more the 40 % of unions were of distant relatives. The distribution of the marriages between first cousins through the generations showed that the frequency of unions between parallel cousins was superior than that of the unions between crossed cousins. It was 60, 42 % against 39, 58 % respectively to the current generation. Among the parallel first cousins, the marriage with the daughter of brother of the father was the most answered that with the daughter of sister of mother to both studied generations. The rate was 68, 97 % against 31, 03 % to the generation of the parents, then, it was 85, 71 % against 14, 29 % and 83, 33 % against 5, 88% to the generation of the paternal and maternal parents, respectively. Conclusion: Consanguineous marriage plays an important role in expression of deleterious recessive genes. Public awareness of genetic risks associated with consanguineous marriage and the importance of premarital genetic counseling is indispensable.*

Key Words: *Consanguineous marriage Coefficient inbreeding Typesconsanguinity Morocco*

I. Introduction

The consanguineous marriage is defined as being the union between individuals possessing one or several common ancestors. It is a practice still respected in the majority of the communities of North Africa, the Middle East and western Asia [1].Approximately 1 billion people live at present in countries where the consanguineous marriages are the rule and among them a person out of three of the marriages is between cousins [2].This marriage type is very answered in the countries of the Maghreb in spite of the modernization [3]. Moreover, a survey on the Population and the Health in Morocco denoted that the rate of consanguinity was 33 % [4] in 1987 and 29 % in 2011[5].Also, studies made in certain regions of Morocco still showed the dominance of this practice, in particular between the first cousins with frequencies varying relatively from a region to another. Numerous factors enter the choice of this marriage type, in particular the geographical closeness [6], the socioeconomic level also plays an important role in this type of union. In spite of these advantages which could motivate this type of union, the consanguineous marriage is not only involved in the incidence of the hereditary diseases recessive autosomal, but also in the growth of the multifactorial diseases [7]. The objective of our study is to determine the frequency of the consanguineous marriage, the coefficient of inbreeding and types of consanguineous unions in the sample in the region of Tanger-Tetouan Morocco.

II. Patients And Methods

1.1 Area of study

The region of Tanger-Tetouan is situated extremely in Northwest of Morocco. It is limited to the North by the Strait of Gibraltar and the Mediterranean Sea, on the West by the Atlantic Ocean, in the South by the region of Gharb-Chrarda-BéniHssen and in the East by the region of Taza-Al Hoceima-Taounate. Unlike all other regions of Morocco, the region of wilayas Tanger-Tetouan accounts two Wilaya: the first one of Tanger

and second of Tetouan, The region of Tanger-Tetouan counts the provinces of Chefchaouen, FahsAnjra, Larache, Ouezzane, Tetouan and the prefectures de Tanger-Assilah and Mdiq-Fnidek. His surface is 12, 425 km². The population is estimated in 2011 to 2 668 000 inhabitants without considered the province of Ouezzane(Figure1)[8].

Fig.1.The Geographical position of the region of Tanger-Tetouan within Morocco

2.2 Source of information

The data collection which is used in this study was a questionnaire developed by the team of Laboratory of Genetic and Giometry of Faculty of science in Kenitra, intended for the students. This questionnaire, besides the respect for the ethics for the questioned, contained data relative to the characteristics of the consanguinity of the parents of every student before and after their marriage as «current Generation" and on their paternal and maternal grandparents "previous Generation".

2.3 Studied parameters

The studied characters concerned the rate of the consanguineous marriages, the types of consanguineousmarriage and the coefficient of consanguinity to the population of the region of Tanger-Tetouan of Morocco.

2.3.1 Type of the consanguineous marriage and Coefficient of consanguinity

The geneticists classify the consanguineous marriages according to the Coefficient of consanguinity. Coefficient of consanguinity of an individual I (FI), is the probability that two equivalent genes are identical by mendelienne descent (Inherited from the same common ancestor) [9].
If the parents are not related: F = 0

In other cases FI is calculated according to the degrees of relationship between the individual and one or several common ancestors.

$$FI = \sum_{I=1}^{n} (1/2)^{m+p+1}$$

M = The number of generations which connect the mother of I to the common ancestor.
P = The number of generations which connect the father of I to the common ancestor.
n = Number of common ancestors.

For example, in a first cousin marriage, the FI value for offspring is 0, 0625 (1/16). For double first cousins, FI value of 0,125% (1/8). As for first cousins once removed and second cousins, value FI is 1/32 and 1/64 respectively (Figure 2).

First cousin type was then divided into four subtypes: patrilateral parallel first cousin (Type I or Father's Brother's Daughter), matrilateral parallel first cousin (Type II or Mother's Sister's

Daughter).Patrilateral cross first cousin (Types III or Father's Sister's Daughter), and matrilateral cross first cousin (Types IV or Mother's Brother's Daughter) (Figure 3).

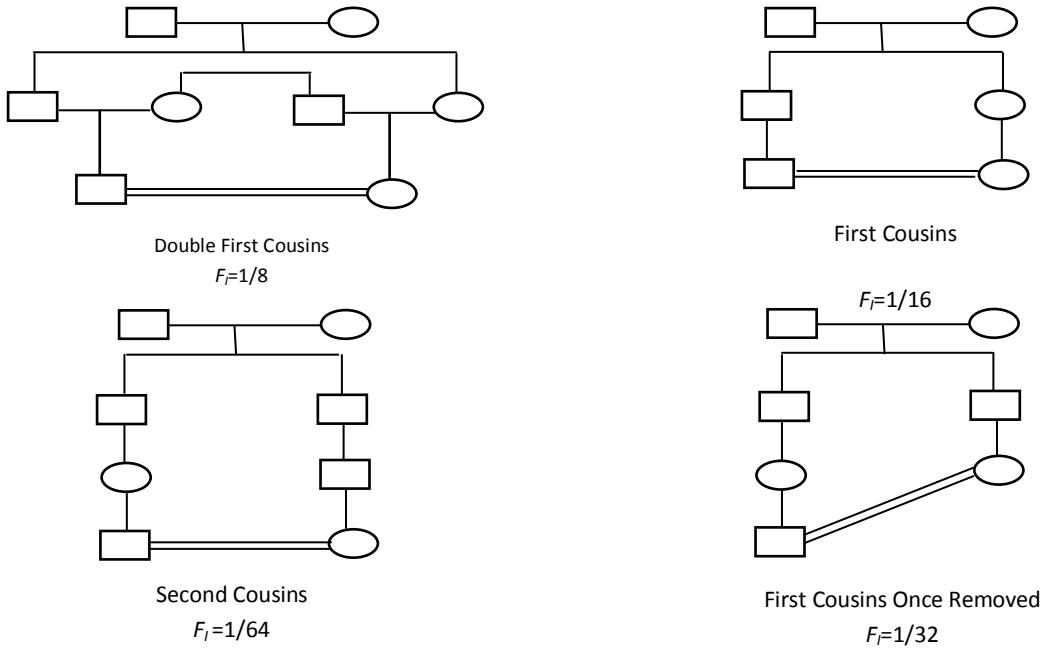

Fig.2. Types of Consanguineous Marriages and Coefficient of Inbreeding of Descendants

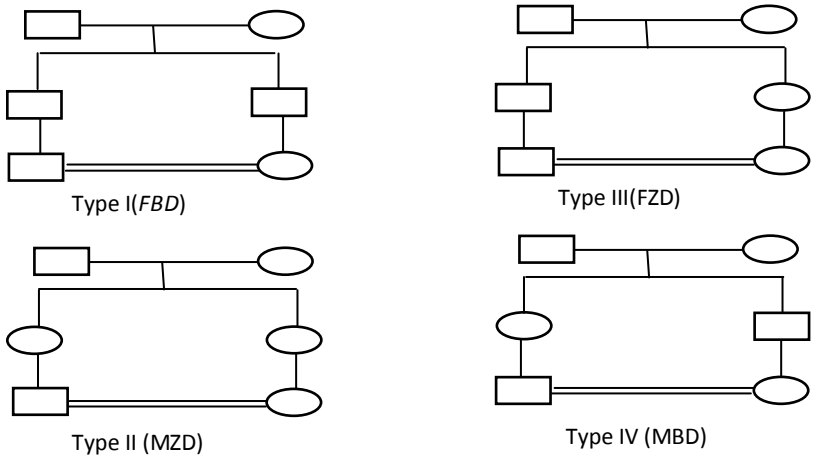

Fig.3. Types of First Cousin Marriages

FBD: Father's Brother's Daughter, MZD: Mother's Sister's Daughter,
FZD: Father's Sister's Daughter MBD: Mother's Brother's Daughter

MEN ***WOMEN***

The coefficient of consanguinity was estimated by the calculation of the mean inbreeding coefficient according to the formula:

$$\alpha = \sum_i f_i F_I$$

Where *fi* is the relative frequency of pairs in each category of consanguineous marriageand FI is the coefficient of consanguinity of this category [10].

2.4 Methodology

A prospective study was conducted among a randomly selected sample of 160 university students in Tanger in the region of Tanger Tetouan of Morocco in 2014. All students were interviewed using a structured questionnaire.The data were seized on Excel and the statistical analysis was made by statistical logiciel. The statistical methodology was based on the descriptive analysis of the data and was expressed in number and in

frequency for the qualitative variables. For the analytical statistics, the qualitative variables were compared by the test Khi2 ($\chi 2$).

III. Resultats

Table 1. Consanguinity rate among the population of the TangerTetouan region

Geneartions	Currentgeneration	Previousgeneration		*p* value
		Parents paternels	Parents maternels	
consanguineous marriages	63(39,4%)	20 (12,5%)	17(10,6%)	χ^2= *p*<0,001
Non-consanguineous marriages	97(60,6%)	140 (87,5%)	143 (89,4%)	

The study of the profile of the consanguineous marriages in the region of Tanger-Tetouan, according to the table 1, revealed a highly significant difference in the rates of the consanguineous marriages betweenthe current and previous generation.It was 39,4% in the current generation compared to 11,5% for the previous generation, p < 0,001 (12, 5% of the paternal generation and 10,6% for the maternal parents), with a mean inbreeding coefficient (up to second cousins) of 0, 02033.

Table 2. Current and previous generation marriage profile in the region Tanger-Tetouan, Morocco

Type of mariage		Currentgeneration	Previousgeneration		*p* value
		Parents	Paternal parents	Maternal parents	
		n(%)	n(%)	n(%)	χ^2= p<0,001
First cousins	*FBD*				
	MZD				
	FZD	48(76,2)	11(55,0)	9(52,9)	
	MBD				
Othertypical of The consanguineous marriage	First cousin once removed	7(11,1)	-	-	
	Second cousin	2(3,2)	1(5,00)	-	
	Total	9(14,3)	1(5,00)	-	
Consanguinity of distant relatives		6(9,5)	8(40,0)	8(47,1)	
Ensemble of consanguineous marriage		63(100)	20(100)	17(100)	
Inbreeding Coefficient		3,25	0,703125	0,5625	

FBD: Father's Brother's Daughter, MZD: Mother's Sister's Daughter, FZD: Father's Sister's Daughter MBD: Mother's Brother's Daughter

The study showed that in the whole of the consanguineous marriages, tended towards the marriages between first cousins in current generation, the rate was 76,2 % against 53,9 % to the previous generation, this difference is highly significant, P< 0,001. While 14, 3 % were other types of consanguineous marriage, with 11, 1 % for the first cousin once removed and
3, 2% for second cousin.

To the generation of the paternal grandparents, more than half of consanguineous marriages were between first cousins, whereas 40 % of unions were ofdistant relatives.

As for the generation of the maternal grandparents, 52,9 % of the related marriages were between first cousins against 47, 1 % of marriage distant relatives.

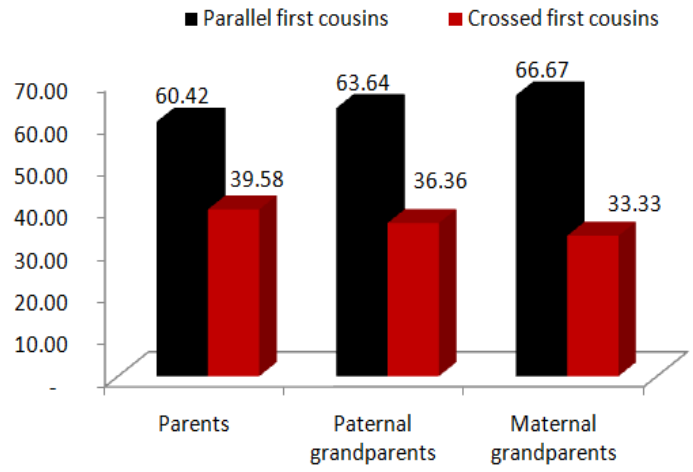

Fig.4. Marriage rate of first cousins in the Tanger-Tetouan region

The distribution of the marriages between first cousins through the generations, showed that the frequency of unions between parallel cousins was superior thanthat of the unions between crossed cousins (Figure4). It was 60, 42 % against 39, 58 % respectively to the current generation.

While at the maternal parents was 66, 67 % against 33,33 % and 63,64 % against 36,36 % at the paternal parents. The difference was not statically significant between both types of the alliances(P > 0, 05).

It is necessary to indicate that the frequency of the marriages between parallel and crossed cousins knew relatively certain stability along the studied generations. 60, 42 % of the marriage between parallel cousins at the spouses and 66,67 %; 63,64 % respectively at the maternal and paternal parents. While frequency of unions between crossed cousin's registered39, 58 % to the current generation and that of the maternal and paternal parents was 33,33 % and 36,36 % respectively.

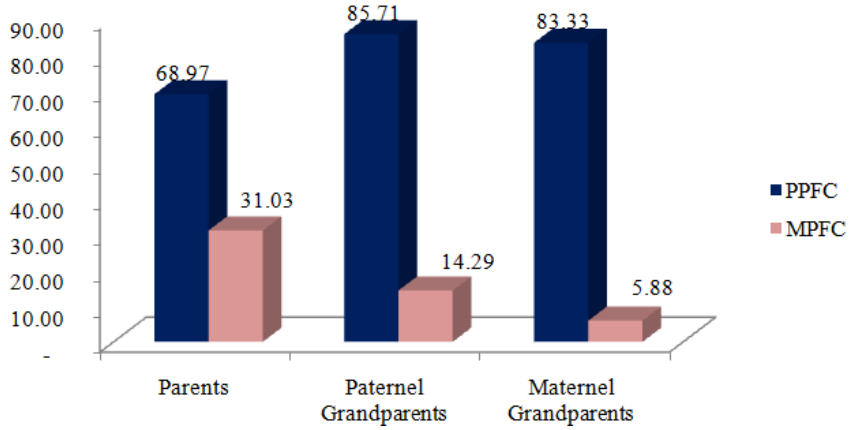

Fig.5. Marriage rate between patrilateral parallel cousinsand matrilateral in the Tanger-Tetouanregion

PPFC: patrilateral parallel first cousin; MPFC: matrilateral parallel first cousin

Among the parallel first cousins, the marriage with thedaughter of brother of the father (patrilateral parallel)was the most answered that with the daughter of sister of mother (matrilateral parallel)to both studied generations. The rate was 68,97 % against 31,03 % to the generation of the parents, then, it was 85,71 % against 14,29 % and 83,33 % against 5,88% to the generation of the paternal and maternal parents, respectively (Figure 5). Nevertheless, it is necessary to note that there was a regression of the marriages withthedaughter of brother of the father, for the benefit of the alliances with the daughter of sister of motherthrough the generations.

IV. Discussion

The consanguineous marriage in the region of Tanger-Tetouan stays a current practice; it represents 39,4 % of the cases compared to with other regions of Morocco with respectively 22,8 % in the region Gharb Chrarda Beni Hsen and 20,6 % in the region of de Rabat-Salé-Zemmour-Zaer[11,12].

Other studies to the population of Fritissa in the Middle Atlas of Morocco and in the region of Doukkala registered respectively 30,32 % and 26,06 of the consanguineous marriages[13].

This high tendency is concomitant with other Arab-Muslim countries which showed another increase of the consanguineous marriages as Saudi Arabia (58 %)[14], Jordan (51 %) [15], United ArabEmirates (50,5 %) [16], Kuwait (54 %) [17], Qatar (54, 5 %) [18],Yemen (40 %) [19] and Bahrain[20].

This preferencewasalsoregistered in Asian countries as India and Pakistan where the consanguineous marriage affected22% % and 60% [21, 22].

Unlike, on an international scale, in particular in South America and Europe, the rate of the consanguinityremainslower in correlationwith the Arab-Muslim and Asian countries.The consanguinity in Brazil and in Chile wasalsorespectively 20,19 % and 14,9 % [23,24].Whileat the level of Spain the rate of the consanguineous marriage establishconstitutedonly 5,70 % [25].

Our studyalsorevealed a growth of the consanguineousmarriages to the currentgeneration (39,4 %) against 11,55 % to the previous one (12,5% of the paternalgeneration and 10,6% for the maternal parents).

Manyfactorscouldexplainthis important frequency of the consanguineous marriage in the region of Tanger-Tetouan, to know the valuation of thismarriage type in thecontextthe traditions worried of maintaining the familycohesion, or the protection of the heritage and youngage of the spouseswho urge the parents to choose the future partner of theirchildren[26;27]. Indeed, according to the data of the National Survey on the Family of 1995, 16 % onlymarriagesresultfrom a mutualchoicebetweenbothspouses. The parents and the family put pressure on the personoldenough to getmarried, in particularduring the first

marriage[28].Otherstudiesreportedthat the spouses of rural originfavor the consanguineous marriage thatthose of originurban[29].

In contrast, the technology, the materiallevel and the modernization have no influence on the choice of the future spouseconcerning the Arab-Muslim society such as the countries of the Middle East, Of the North of AfricaincludedMorocco, thisis a part of their traditions. On the other hand, industrialized countries not are a member of thistendency.

The increaseregistered by the consanguineousmarriages to the currentgenerationwasalsoaccompanied in a strongtendency, towards unions between first cousins (76,2 %) against 14,28 % amongthe distant relatives.Indeedourstudyrevealedthatthereis a clearregression of the marriagesbetween distant relatives for the benefit of the first cousins throughbothstudiedgenerations.Moreover, a surveyat the level of Moroccoshowedthat the reduction in the endogamyisexplainedby the regression of the marriageswith distant relatives.Indeed, the rate of the endogamywith a first cousin remainedalmost stable between 1995 and 2010 (16,3 % and 15,5 % respectively),whilethatwith a distant relatives knew a reduction sensitive from 13 % to 5,1 % whence the progress of the marriageswith a 56 % first cousin in 1995 a75 % in 2010 [8].

This remainssimilar for the MuslimArab countries where the third of the marriageswasbetween first cousin [30].In the Yemen more than 85 % of the consanguineousmarriageswasbetween first cousins [31]. In Tunisia and in Pakistan reportedrespectively 70,13 % and 69 % of union between first cousins [32, 33].

It shouldbenotedthat the type of marriage has not been reported in approximately 50% of the previousgenerationcompared to the currentgeneration (9, 52%), seenthat the studentsquestionedduring the survey ignore the type of consanguinitybetweentheirpaternal and maternalgrandparents, whatrequiresdeepened investigations.

Our studyshowedthatbothstudiedgenerationsgrant a preference for unions betweenparallel first cousins that the crossed cousins, in particularwith the daughter of brother of the father(68,97 %). This remains comparable with a studycarried out in India[34], anddifferentwith the Israeliresults[35].It couldbeconnected to social and cultural faithsprofoundlyrooted in our country as the economicinterest, the right and the duty of the cousin to marryhis cousin.

Nevertheless, weregistered in ourstudy a regression of the marriagesbetweenpatrilaterals cousins in favour of matrilaterals.Such situation wasinterpreted by Khlat in herstudy in the Lebanon as a drift matrilatral of the system of kinship,whichhad the impact of the economicdevelopment on the status of the woman in the country, where the sexualroles are important in the social organization[36].

V. CONCLUSION

The frequency of consanguineous marriage among the currentgenerationis important, couldbeconsidered a common tradition and rooted in the region of Tangier-Tetouan Morocco. A study on the main trends of consanguineous marriages in this population remainsdesirable, therebydeepening the design and understanding of the determinants of this practice factors.

VI. Remerciements

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