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Compliance of Israeli Druze Women to Undergo a Non-Invasive Prenatal Test

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: The Druze community Comprises 1.6% of the Israeli population, with most living in villages in northern Israel. Their religion is secret and is known only to religious Druze.
Aims: To examine the prevalence of Israeli Druze women undergoing a non-invasive prenatal test compared to Israeli Jewish women.
Study Design: This study appears a prospective case control study design
Place and Duration of Study: Israel, 6 months
Methodology: Seventy-six Druze and 66 Jewish women completed a questionnaire published in social media using Qualtrics software and analyzed with SPSS software.
Results: We found that the Israeli Jewish women underwent and were more familiar with non-invasive prenatal testing and other screening tests than the Israeli Druze women. Furthermore, after testing the entire women's population, women living in the center of the country significantly underwent more prenatal testing than the women living in Israeli villages in the periphery of the country (Spearman correlation test). A positive correlation was found within the entire women's population between undergoing a non-invasive prenatal test and the socioeconomic and educational status of the women; a negative correlation was found with the level of religiosity. All of the correlation tests were performed by the Spearman correlation test.

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Conclusions: More health care professionals must provide further counseling and explanations in respect to the different prenatal diagnostic tests existing today, including this new advanced test which will most likely be the main prenatal test performed in the future on all populations, even for those living in the periphery.

Keywords: Consanguinity; Druze population; genetic counseling; non-invasive prenatal testing; religion.

1. INTRODUCTION

Druzism has gained popular support in the Levant and its adherent, albeit, its small number and has played a disproportionately large role in the social, political and cultural shaping of the Levant, and in Israel, in particular. The majority of Druze are genetically closer to the Syrian populace than to other Levantine populations, sharing a genetic similarity with Arab and Near Eastern populations [1]. In a study reporting on the different mutations of the ataxia telangiectasia (AT) occurring in the Druze population, the authors described two founder effects of AT with two different mutations [2]. These effects were discovered in four Israeli Druze clans originating from three different Druze populations residing in the Middle East, Lebanon, Syria and Jordan [1].

The Druze follow an esoteric religion, incorporating Islam, Judaism, Zoroastrian, Hindu, Christian, Neo-platonic and Persian influences. The Druze community encompasses 1.6% of the Israeli population and is characterized by consanguinity and endogamy. There is a great reluctance in this population to undergo genetic testing and technological interventions in preventin birth defects [3-5]. For example, cases such as multiple patients with four rare and severe inborn errors of metabolism cerebrotendinous xanthomatosis, prolidase deficiency, argininosuccinate lyase deficiency, and carbamyl phosphate synthetase I deficiency were identified in an isolated Druze village in northern Israel [3]. The aims of this study and other studies investigating disease mutations, were to identify couples at risk for different inherited diseases, to increase their awareness of genetic counselling and to prevent birth defects in a community presenting religious and cultural obstacles to genetic testing [3,5]. The genetic screening program was well received in the Druze villages and, hopefully, will serve as a model for increasing the awareness of genetic counseling and disease prevention in other isolated communities [2-5].

A high inbreeding coefficient is a risk factor for birth defects and autosomal recessive (AR) disorders [2-5]. Not surprisingly, the prenatal incidence in Israel for almost all major malformations is highest amongst the Druze community. The fact that terminating pregnancies of affected fetuses is less common amongst the Druze, the difference in the rate of malformations between these populations is far greater than premature births. Several studies have found that the rate of Down syndrome (DS) in the Druze community was 2.4 times higher than in the Jewish population. Furthermore, the rates for anencephaly and encephalocele were more than five times higher [3-5].

The first recognized prenatal screening test was based on a single maternal serum marker of a neural tube defect, the alpha feto protein. Subsequently, various prenatal screening concepts were introduced. The most successful was the DS estimation, utilizing multiple serum and ultrasound markers [6]. However, and despite the importance of undergoing invasive procedures such chorionic villous sampling (CVS) or amniocentesis (AC) during pregnancy, women from diverse ethnic groups have expressed different attitudes towards these tests, preferring to only undergo screening tests [7,8].

The non-invasive prenatal test (NIPT) analyzes the short DNA fragments released into the plasma from normal cellular turnover, rapidly cleared from circulation. In a pregnant woman, most of the DNA is derived from the turnover of the maternal cells. However, a proportion are derived from the outer trophoblast cell layer of the placenta, typically reflecting the fetal genotype. The percentage of this DNA is termed “fetal fraction”. There is a wide normal range of fetal fraction. The median value at 10 weeks is ~10% fetal DNA fraction from the maternal DNA [6], yielding the approximated risk for a limited number of syndromes, specifically, DS [6,9].

Since NIPT measures cell-free DNA derived from the placental villi, it does not always correspond

with fetal DNA, therefore, the results require careful interpretation. Up to 10% of cell-free DNA results do not match normal fetal/neonatal karyotypes due to false positives and negatives. Therefore, pregnant women who are considering undergoing a NIPT, should receive genetic counseling in order to comprehend the potential detection of a congenital disorder, as well as the shortfalls of prenatal testing. It is important to establish a genetic counseling system that encourages and enables pregnant women to independently make their decisions [9].

Based on the findings of previous studies examining the role of ethnicity in multiple healthcare domains conducted in Israel and other Moslem countries [7,8], the present research compared the attitudes and perceptions of Israeli Druze and Israeli Jewish women in regard to the benefits of prenatal testing, especially, the new NIPT and the other screening tests. Social status, work, education, place of living and religiosity, were also examined.

2. METHODOLOGY

Participants were recruited through advertisements in various social media and public nurses using a convenience sampling method. The final sample size included 76 Israeli Druze who were pregnant and postpartum women residing mostly in the northern villages and the Golan Heights (study group) and 66 Israeli Jewish who were pregnant and postpartum women residing throughout the country (control group). Those who were never pregnant, did not participate in our study. Mean age of the participants was 34, ranging from 19 to 54. Israeli Druze and Israeli Jewish women were invited to participate in an online survey examining various health issues. Specifically, participants were informed that they were participating in a study researching the attitudes of women relating to pregnancy issues, i.e, attitudes towards prenatal testing, pregnancy termination and their potential emotions that such a procedure would generate.

Most of the Jewish women resided in the cities, ~89% lived in the center of Israel and most defined themselves as secular (47%), whereas, the Druze population resided in villages (85%) in northern Israel and were mostly traditional (59%). The earning level of the Jewish women (39%) was the mean income, whereas, the Druze women (47%) earned less than the mean income. The first dependent measure was the demographic parameters. Participants were asked to provide their demographic details, socioeconomic status, education, residency and socio-economic level. The second dependent measure was religiosity and its influence on the decision-making process. The third dependent measure was the attitude of the participant as to the different screening tests, in addition to the reproduction and pregnancy history in each of the families. The fourth measure was the awareness, and willingness to undergo a NIPT and the factors that influenced the decision to undergo or not to undergo a NIPT.

2.1Statistical Analysis

Statistical analysis was performed using the SPSS software. The chi squared test, t-test, Spearman test and Pearson correlation tests, were also performed. Means and standard deviations were reported for continuous and normally distributed data**.** The chi squared, and t tests compared variables of the Druze and Jewish respondents; the Spearman correlation test explored the relationships between the study variables.

3. RESULTS

Jewish women ($p<0.05$) tended to undergo more screening tests ($p<0.05$), particularly, a NIPT ($p<0.01$, Table 1) in combination with the independent samples t-test than the Druze population.

We found that the Druze women would undergo less prenatal screening tests (the NIPT in combination with other screening tests) than the Jewish women.

In general, women who live in cities in the center of the country undergo more NIPTs, than the women who live in villages and in the periphery. Furthermore, women who worked outside the home were more willing to undergo a NIPT ($p<0.01$), than the stay-at-home women. The Spearman correlation test showed that women with a higher level of education were more willing to undergo a NIPT ($p<0.05$, Fig 1).

The more educated the woman, the more she would undergo a NIPT.

A negative correlation was found between the religious level and the willingness to undergo a NIPT ($p<0.01$). The more religious the woman, the less she would agree to undergo a NIPT.

Moreover, a Spearman correlation test showed a positive correlation between the socio-economic status and undergoing a NIPT ($p<0.001$, Fig. 2). A high positive correlation was found between the socioeconomic status and undergoing a NIPT. The higher the income, the more the women would undergo a NIPT.

According to the chi squared test for non-dependence, answering the question, "Are you acquainted with women belonging to your ethnic group who have undergone a NIPT?", we found that more Jewish women (40%) were acquainted with women who had undergone the test, than the Druze women (18%). Moreover, Jewish women (53%) versus the Druze women (42%) were more familiar with the test through information received from clinical staff members, friends, and family, however, due the small sample size, it was not found significant.

Table 1. The willingness to undergo different screening tests including the non-invasive prenatal test (NIPT) amongst Jewish and Druze women*

Dependent variable	Druze women M (SD)	Jewish women M (SD)	t-test
The willingness to undergo screening tes including the NIPT	3.15 (1.53)	3.67 (1.28)	T (133)=2.101

**p=.038; Abbreviations: M (SD), mean (standard deviation)*

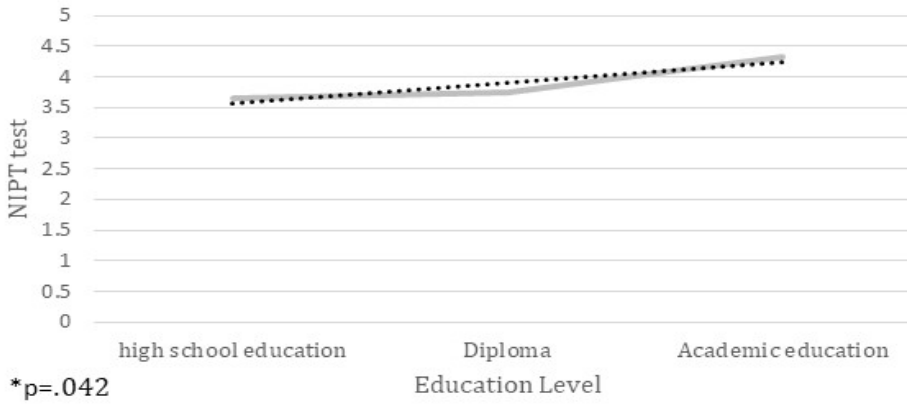

Fig. 1. Spearman correlation test showed that the more educated the woman, the more her willingness to undergo a NIPT

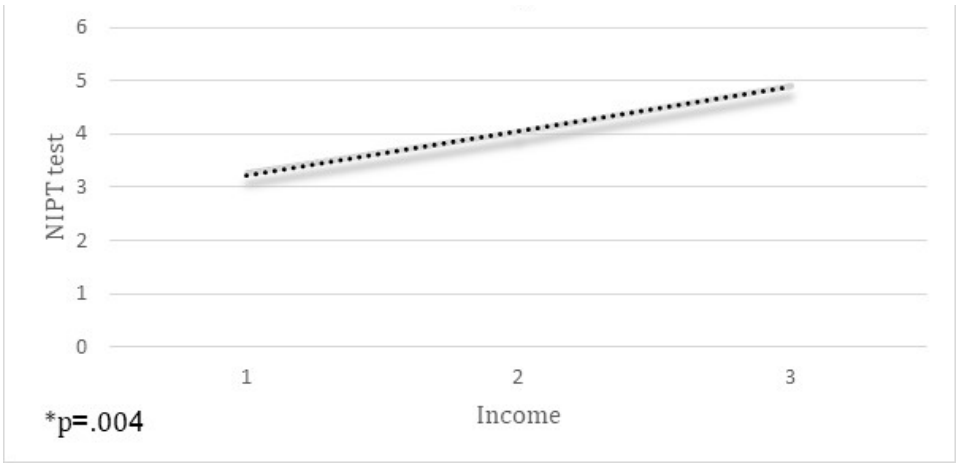

Fig. 2. Spearman test showed a positive correlation between the socioeconomic status and the willingness to undergo a NIPT

4. DISCUSSION

According to our results, the women residing in cities in central Israel were more aware of the NIPT and underwent this test more often than the women residing in the periphery. The new and more accurate screening tests, such as the NIPT, which has been performed in Israel since 2014, has been found very reliable in detecting DS in a fetus [6]. It is reasonable to assume that the explanations and counseling relating to this test are being presented to the populations residing in the central cities of Israel.

The Druze population in Israel belongs to the Arab population and encompass 1.6% of the Israeli population. In this study, most Druze women thought of themselves as traditional, not religious, nevertheless, more comparable to the Islamic religion rather than to the Jewish religion [1,4]. Extensive research has explored the role of ethnicity on various healthcare domains demonstrating that members of disadvantaged ethnic groups experience poorer physical health than the advantaged groups [6]. One potential significant social factor contributing to these disparities may be the cultural differences preventing members of a specific ethnic group from undergoing certain medical procedures. Indeed, studies focusing on Muslim women from western countries have illuminated the possible effects that cultural and religious factors play in their decisions, i.e., whether to undergo prenatal testing. Specifically, undergoing invasive prenatal tests, widely used in the general population, were found more limited amongst the Moslem women [8,10].

A recent research study investigating the cultural aspects of prenatal testing found that women of Pakistani origin chose not to undergo invasive testing due to the risk of miscarriage and the difficulty in terminating the pregnancy following abnormal test results [10]. Similarly, another study found that Moslem women of Turkish origin were less likely to consider terminating the pregnancy due to their religious convictions regarding antenatal screening , even if the fetus was diagnosed as abnormal [11]. In 2015, a study carried out in the Netherlands focusing on Moslem Moroccan women reported that pregnant Moslem Moroccan women preferred to be accurately informed as to the antenatal anomaly tests and to be asked about their individual beliefs regarding the value of life. It was felt that counselors must explore the clients' moral values relating to quality of life and its termination, as well as how their religious beliefs affect these values [12].

Recently, a study conducted in Israel amongst Arab Moslem women whose fetuses had been diagnosed with congenital anomalies, focused on the subjects' decision-making regarding the termination of the pregnancy. It was found that in order to mitigate gaps, doctors when communicating with their patients must consider the social and religious factors that may affect the woman's decision-making process [13]. Furthermore, a research study conducted by Jaber et al. (2000), showed that amongst Israeli Moslem women who were at an increased risk of delivering malformed babies due to the high frequency of consanguinity, acceptance of prenatal testing was relatively low, due to their "religious opposition" to terminating the pregnancy pursuant to such guidance by health professionals [14].

As described, the Druze population is characterized as a population with a high frequency of consanguinity marriages, consequently, rare genetic diseases emerge in some families [3,4]. Indeed, previous studies have shown that the more religious the woman is, the less she will agree to an artificial abortion or pregnancy termination, concurring with this study's conclusions. The "will of Allah or God" is a dominant factor amongst the very religious populations of both religions [8,11,12,15]. A Dutch study published in 2014 revealed that religious conviction plays a role in antenatal screening decisions amongst pregnant Turkish Moslem women who would not consider termination of the pregnancy, even when the fetus was found to be affected [11].

Amongst Israeli Jewish women, it was reported that 94% of the secular women, 36.4% of the religious and none of the ultra-religious women >35 years underwent an invasive procedure [16]. This finding particularly highlights the importance of promoting genetic counselling amongst members of socially disadvantaged racial and ethnic groups [13,14,16,17]. Amongst the ultra-orthodox Jews in Israel, none had undergone prenatal diagnosis invasive tests, albeit, some had only undergone the most common screening tests, i.e., nuchal translucency and alpha feta protein [18]. Most of the Druze women in this study claimed to be traditional in contrast to the Jewish women, who were mostly secular.

Similar and relevant studies to our findings, previous studies have reported that women who

would undergo regular prenatal invasive and screening tests, including the NIPT, are more educated and in a higher socioeconomic bracket [19-21]. This outcome has also been observed in certain Moslem populations throughout the world [22]. Most of the Druze participants in our study were educated and worked outside the home, however, most defined themselves as earning less than the mean income, denoting that they were in the lower socioeconomic level . The NIPT in Israel is performed privately, not through HMOs and is very expensive (~$1500). Furthermore, more Druze women are unaware of this test compared to the Jewish women. Microarray analysis and next generation sequencing (NGS) in NIPT will enable more exact results relating to other genetic disease syndromes and genome aberrations. In the future, NIPT will hopefully be employed as the main prenatal test, hence, at present, knowledge and counseling are very important [23].

In a recent qualitative study in Israel researching genetic testing counseling for ethno-cultural minorities in women, 50% claimed they had no knowledge of available genetic tests [24]. It was concluded that acknowledging and better understanding the barriers to genetic counseling in the Arab sub populations will probably help to decrease gaps of knowledge [13,22,24]. In the past, rare disease gene diagnoses and prenatal tests were being performed in the Israeli Druze population [2-5], however, very inadequately.

Our findings may assist health care professionals (physicians, nurses, genetic counselors, and midwives) in providing informed counseling, thereby, aiding the women and their partners in the decision-making process as to whether to undergo or not undergo prenatal testing. Racial, ethnic and socioeconomic differences in prenatal testing strategies are mediated by risk perception and attitudes. Optimal prenatal testing, in depth-counseling and discussions, require clarification of risks, considerations of key attitudes and preferences as to the possible sequence of events after testing decisions [25]. Information and counseling should be offered throughout the country, especially, amongst all minorities, and traditional or more religious, enabling them to attain the knowledge and the option to choose the appropriate tests. At present, there are limited studies and data reporting on the Moslem, Druze and even the Jewish populations, regarding the decisions that women from different ethnic groups must reach upon receiving an abnormal diagnosis and thereafter, have to decide whether to undergo an invasive diagnostic procedure. The studies that we described herein, from other countries, did not discuss this point.

5. CONCLUSION

Druze women in Israel undergo a NIPT, however, there is less knowledge and awareness of this test than in the Jewish women's population, most likely due to the fact that most Druze women live in villages in northern Israel and are in a lower socio-economic bracket. More counseling and involvement by health care professionals is essential in this community, not only regarding the incidence of rare diseases and prenatal diagnoses, but information as to the new tests presently available for diagnosing prenatal malformations.

6. LIMITATIONS

Our small sample was a limitation. We would have preferred a larger sample size of both populations. The timing of the questionnaire can also be a problem since we chose any gestational age, including postpartum. It is reasonable to assume that the women's views would be different when they are faced with the contemporary scenario of decision making, i.e., if at 11-14 weeks, they were diagnosed with an abnormal fetus, would their decisions be different compared to a postpartum woman giving birth to a healthy baby. In our future studies, we will limit the period of the gestational age, depending on the subject of the relevant study and will investigate the women's reaction upon receiving an abnormal diagnosis from a NIPT and/or other screening tests.

CONSENT

Informed consent was included in the questionnaires.

ETHICAL APPROVAL

The study was approved by the Ethics Committee of the School of Nursing Sciences, The Academic College of Tel-Aviv-Yaffa, Israel on October 2021, #1004.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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