RELATIONSHIP BETWEEN DESIRABLE FETUS GENDER AND TYPE OF CONSUMED DIET: A CROSS-SECTIONAL STUDY

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Abstract

Background: Maternal diet can affect the development of the fetus in several manners including the gender of the fetus. However, there are some reported studies indicating a relationship between maternal diet and gender of the baby. In other words, maternal diet can determine the gender of the baby. This study aimed to evaluate the relationship between maternal diet and baby gender.

Methods: This was an analytical cross-sectional study to spot light on the relationship between maternal diet and baby gender. Since the aim of the study was to determine the relationship between maternal diet and baby gender among Saudi, this is the suitable design for this research. The study was carried out among Saudi population. Data were collected from general population using questionnaire during the period from April to October 2021.

Results: The study included the participation of 755 women from different age groups in the Kingdom of Saudi Arabia. The most prevalent age group was 36-40 years (n= 193, 25.6%) followed by the age group more than 40 years (n= 189, 25%) while the least frequent age group was below 22 years (n= 83, 11%). The number of participants who reported having one children were 116 participants. On asking the participants who had male babies whether they craved for special food or not, their answers varied. Salty food, pickles and potato chips were preferred among 298 participants while sweets and chocolate were the favorite food among 155 participants. The special diet is statistically significant with the baby gender at p value of 0.001.

Conclusion: The current study showed that diet preference among mothers affects the gender of the baby as the results showed. Some mothers intentionally reported following special diet in order to have specific gender.

Introduction

The human diet involves the simultaneous intake of a variety of nutrients and foods that are highly correlated and may have synergistic and inhibitory properties [1-2]. These interactions may hinder the detection of possible associations between specific foods and health outcomes [2-3]. Dietary preferences are also influenced by cultural, social, economic and environmental determinants [4].

Research has demonstrated that healthy eating habits during pregnancy affect fetal development and contribute to prevent pregnancy complications [5-6] and the occurrence of diseases in adulthood [7]. An appropriate diet helps recovery from childbirth and favors breastfeeding [8]. Additionally, pregnant women pay more attention to diet and food choices than non-pregnant women [9]; thus pregnancy is an ideal time to make changes to dietary habits [10]. Dietary patterns during pregnancy have been associated with nutritional intake, sociodemographic characteristics and outcomes for babies [8-15]. Dietary patterns rich in vitamins, minerals and proteins are associated with higher birth weight [13]. Older women with a higher level of education are more likely to follow a healthy diet and prevalence of pre-gestational overweight is lower in this group [8, 12, 14]. It has also been shown that increased parity, pre-pregnancy maternal overweight, being single and unemployed and smoking are factors associated with unhealthy dietary patterns during pregnancy [12, 14].

A study carried out in the Southern Region of Brazil also pointed to a positive association between diet and socioeconomic status, showing that women of higher socioeconomic status are more likely to follow a healthy diet [16]. However, a study of a cohort of young adults demonstrated that, although socioeconomic status affected dietary patterns, having a higher level of education or higher income was not a protective factor for healthy eating [17].

Comprehensive nutritional assessment and guidance are not routine during prenatal care in KSA and medical professionals often lack a comprehensive understanding of the sociodemographic factors that influence women's eating habits during pregnancy, thus leading to considerable variation in nutritional advice given to pregnant women.

Literature Review

A healthy diet is an important part of a healthy lifestyle at any time, but is especially vital when pregnant or planning a pregnancy. Eating healthily during pregnancy will help the baby to develop and grow correctly. Fetal growth problems may be suggestive of environmental exposure, which may affect the physiology of organ systems, leading to fetal growth retardation and increased risk of chronic diseases in later life [18].

Maternal nutrition has been recognized as one of the most important extraneous stimuli influencing fetal growth and development and it is considered one of the most important modifiable factors during pregnancy, a time period in which a greater contribution of nutrients and energy is required to meet the demands of fetal development [19]. Thus, good maternal nutritional status, together with other healthy life factors, helps maintain a correct balance in fetal nutrition and endocrine status during pregnancy, which is essential to the health of the mother and child [20]. Traditionally, dietary assessment in pregnant women was performed by analyzing the intake of certain foods and energy content together with the contribution of micro- and macronutrients [21]. By not considering the maternal diet as a whole, possible interactions between foods and nutrients could be overlooked [22], and hence there is a growing interest in the study of dietary patterns in pregnancy [23].

Diet is a dietary pattern reflecting the different customs and cultural interrelations of the civilizations that have developed in the basin over the years. Traditionally, it has been characterized as a diet based on high intake of vegetable foods (oil, fruits, vegetables, legumes, cereals, nuts), moderate intake of dairy products, fish, poultry, and eggs, and low intake of red meats [24]. Given this, the MD seems to guarantee a caloric and nutrient supply in sufficient quantities and adequate proportions [25]. This dietary pattern is low in saturated fatty acids, rich in carbohydrates, fiber, and antioxidants, and has a high content of monounsaturated fatty acids and n-3 polyunsaturated fatty acids, which are primarily derived from olive oil and fish intake [26].

The effects of adherence to the pattern during the perigestational period have been studied. An association with lower risk of preterm birth [5,9,13,14], miscarriage [15,16,17], hypertensive disorders [18], or gestational diabetes [19,20], as well as lower weight gain in these women [5,21,22] has been suggested. Likewise, it has also been associated with a lower risk of congenital malformations such as spina bifida [23] or cardiac defects [24], as well as a lower risk

of intrauterine growth restriction [9,21,25,26,27] and even long-term effects such as better bone quality [28,29], and lower risk of development of atopy [30,31] and/or abdominal obesity in childhood [32]. To the best of our knowledge, there is no prospective data on the impact of maternal adherence to an MD during pregnancy on anthropometric measures in their offspring.

However, all these benefits are lost in today's society, in which this traditional diet pattern is increasingly less common. In Spain in particular there has been a remarkable evolution in the patterns of food intake in the last 40 years, in all age ranges [33,34]. Healthy life habits are being abandoned, increasingly approaching a westernized pattern, with high intake of refined sugars and foods of animal origin, especially red meat and derivatives, and a decrease in intake of foods of plant origin, leading to an increased presence of saturated fats and cholesterol in the diet [33,35,36].

This trend seems to affect even pregnant women and it would therefore be appropriate to identify the profile of women at greater risk of low adherence (LA) versus optimal adherence (OA) and to raise awareness about the value of good nutrition and its impact of the development of the newborn [3,37].

Low birth weight (LBW) is usually defined as birth weight of a live born infant below 2500 g [38]. LBW infants define a heterogeneous group: some born too early, some born at term but small for gestational age (SGA), and some both born too early and SGA [39]. SGA newborns are those who are smaller in size than normal for gestational age, most commonly defined as a weight below the 10th percentile for gestational age. However, the designation has prognostic importance because it predicts susceptibility to hypoglycemia, hypothermia, and polycythemia [40]. LBW and SGA are recognized as a disadvantage due to risk of early growth retardation, fast catch-up growth, infectious disease, developmental delay, and death during infancy and childhood, as well as development of obesity and non-communicable diseases later in life [41]. On the other hand, and due to the disparity of results in the available literature on this topic, it is also important to continue studying the effects of the MD and other nutritional factors during pregnancy on the health of the newborn.

Methods

Study design

This was an analytical cross-sectional study to spot light on the relationship between maternal diet and baby gender. Since the aim of the study was to determine the relationship between maternal diet and baby gender among Saudi population, this is the suitable design for this research.

Study setting

The study was carried out among Saudi population. Data were collected from general population using questionnaire during the period from April to October 2021.

Sampling and sample

Participants were chosen via probability simple random sampling technique. Participants were selected from the general population. The expected number of sample size was 500 participants. However, the study included 755 participants.

Inclusion criteria: Mothers from general population.

Exclusion criteria: none.

Instruments

Data collection tool was self-designed and base on latest literature. It contained the following information: (1) basic information about participants and (2) disease related information.

Statistical analysis

Data obtained from questionnaire were entered and analyzed using SPSS program version 23 computer software. Sociodemographic data are presented using descriptive statistics as means, median, percentages and standard deviation. Independent T test and one-way Anova are used to show statistical significance among patients' characteristics and tool scores. Chi square test is used to show relationship between categorical variables. Univariate and multivariate analysis will be performed to investigate association between gender of parents, education level and knowledge and prevent of tooth decay.

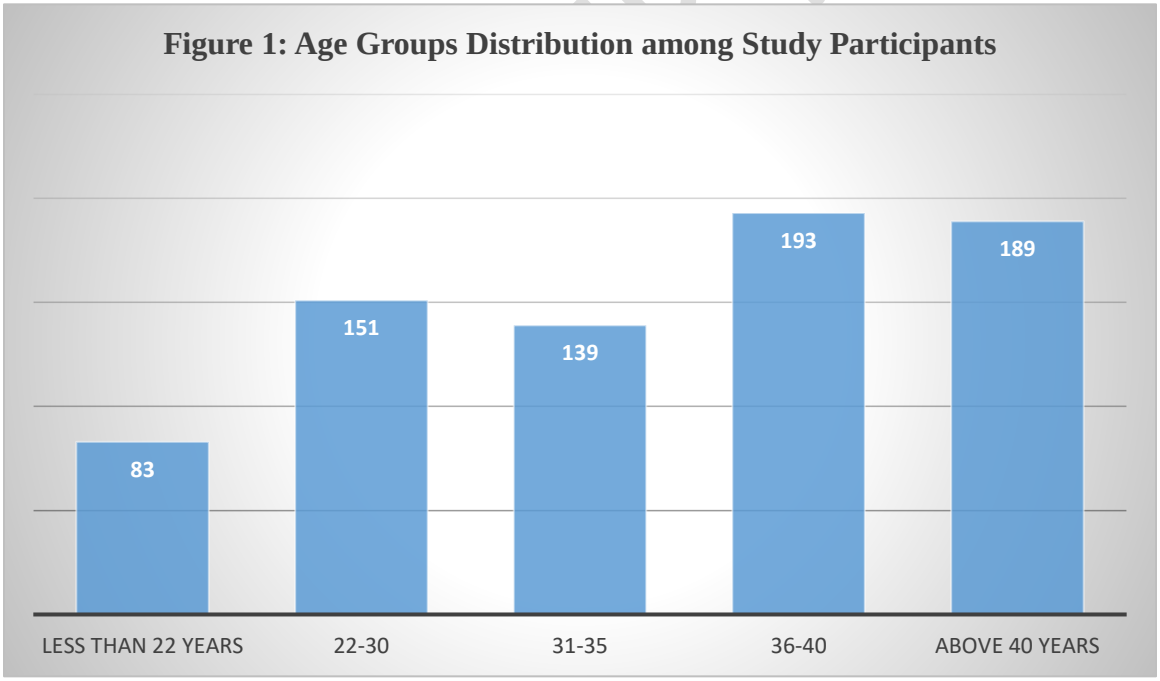
Permission and ethical considerations

Administrative approval will be sought from the unit of biomedical ethics research committee Ethical approval was sought from the ethical committee of the faculty of medicine, king Abdul-Aziz university. An informed consent was sought from the participants.

Results

The current study aimed to examine the relationship between food preference and gender of fetus during pregnancy and after giving birth. The study included the participation of 755 women from different age groups in the Kingdom of Saudi Arabia. The most prevalent age group was 36-40 years (n= 193, 25.6%) followed by the age group more than 40 years (n= 189, 25%) while the least frequent age group was below 22 years (n= 83, 11%). The distribution of age groups among study participants is presented in figure 1. Slightly more than half of participants were Saudi population (n= 451, 59.7%) and the rest were non-Saudi participants (n= 304, 40.3%).

Figure 1: Age Groups Distribution among Study Participants



Study participants reported having different numbers of children at time of filling the questionnaire. The number of participants who reported having one children were 116 participants. The rest of results of number of children are presented in figure 2 and the distribution of number of children among age groups is presented in table 1.

Figure 2: Number of Children among Study Participants

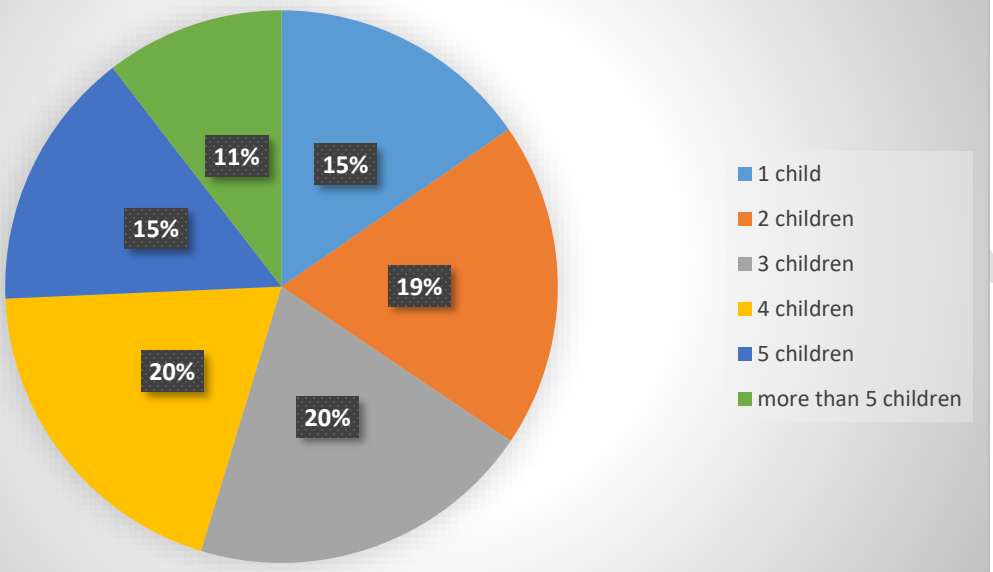


Table 1: Number of Children Distributed by Age Groups among Study Participants

No. of children	Less than 22	22-30	31-35	36-40	More than 40
1	58	39	9	5	5
2	19	71	28	17	9
3	3	22	45	52	31
4	2	10	35	63	38
5	0	8	21	48	38
More than 5	1	1	1	8	68

On asking the participants who had male babies whether they craved for special food or not, their answers varied. Salty food, pickles and potato chips were preferred among 298 participants while

sweets and chocolate were the favorite food among 155 participants. On the other hand, 186 participants answered others and the rest reported not having a male baby yet (Table 2).

On the contrary, the food was craved during the pregnancy of female baby was close to the percentages of male food. There were 193 participants craved for salty foods and 226 participants craved for chocolate and sweets. There were 224 pariticpants answered others and 112 participants reported not having a female baby yet (Table 2).

Table 2: Type of Food Mothers Craved for During Pregnancy of Male or Female baby

Type of food	Male baby	Female baby
Salty food, pickles and potato chips	298	193
Sweets and chocolate	155	226

There were 95 participants reported following special diet to determine the gender of the baby (12.6%). Among them, participants who wished for male baby ate banana, avocado, apples and sea food and others. The special diet mothers followed to have a male baby is presented in figure 3 while the special diet mothers followed to have female baby is presented in figure 4. The special diet is statistically significant with the baby gender at p value of 0.001.

Figure 3: Special Diet for Male Baby

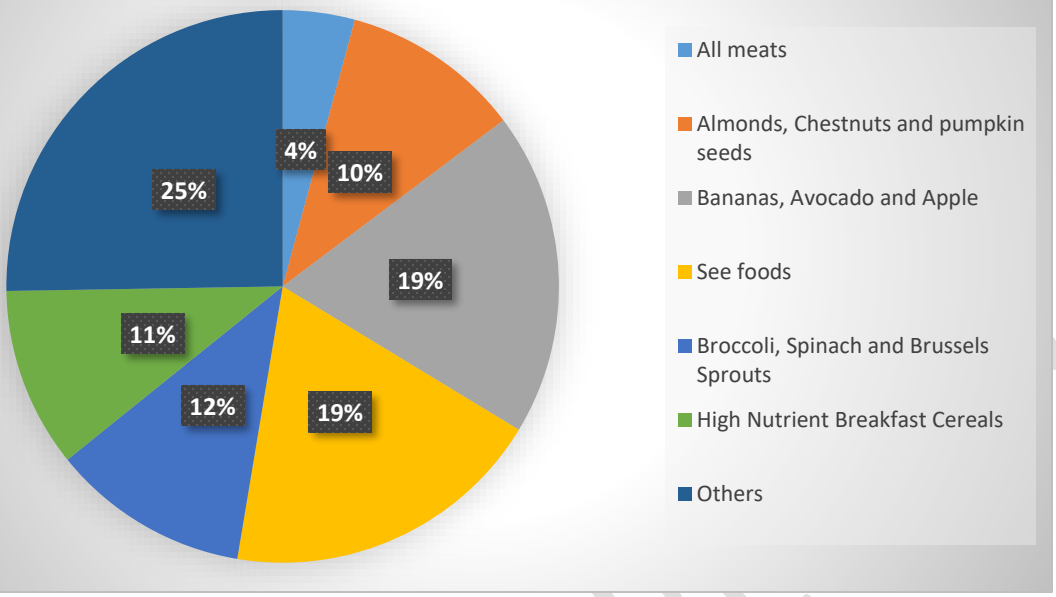
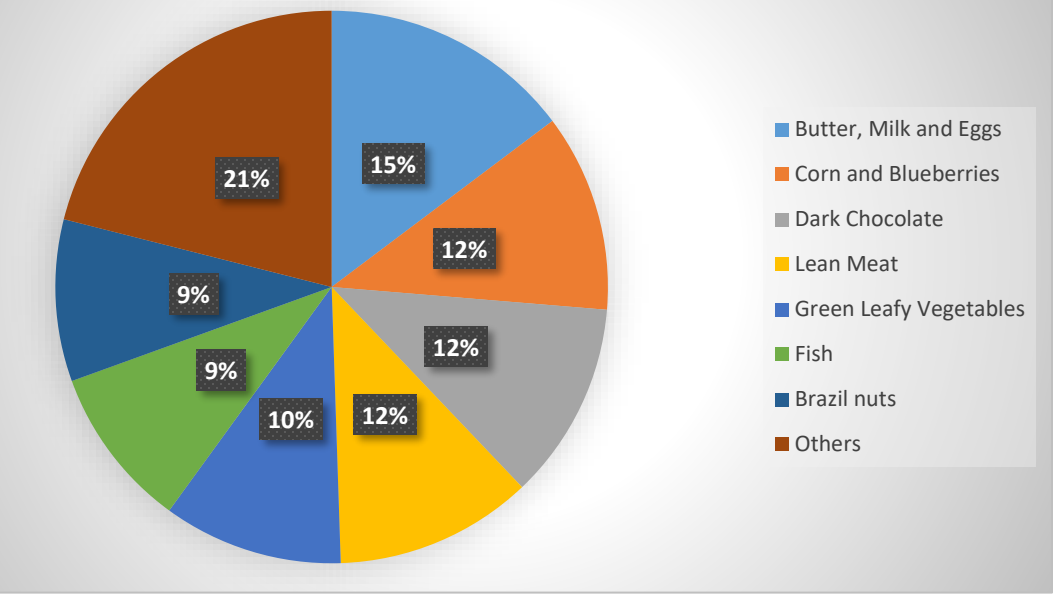


Figure 4: Special Diet for Female Baby



Regression analysis for the effect of the diet on the baby gender is presented in the following table:

Table 3: Coefficients regression analysis					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	7.837	.872		8.982	.000
Sea food	.386	.283	.089	1.362	.175
Banana, avocado and apple	.175	.155	.083	1.129	.260
Butter and milk	-.143	.189	-.048	-.755	.451
Breakfast cereals	.275	.211	.082	1.305	.193
Lean meat	-.249	.182	-.090	-1.369	.172
Fish	.031	.115	.017	.271	.787
All meat	-.454	.239	-.120	-1.899	.059
a. Dependent Variable: Fetus gender					

Discussion

Gender preferences are a well-known feature of human society. A couple's gender preference for children is usually influenced by their traditional background and cultural practices which has been handed over from generations. Wide differences in gender preferences exist in both developed as well as developing countries of the world. An empirical review of standardized data from 17 European countries with respect to their gender preference for children showed a strong tendency towards a mixed sex composition. Interestingly, girl preference was seen in Czech Republic, Lithuania and Portugal. All the countries in the review had similar socio-economic conditions and family policies [42]. Individual studies from UK, and Turkey have also reported a strong preference for daughters [43-44].

In another review of data from 50 developing countries majority had a balanced gender preference i.e. a preference for equal number of boys and girls. Latin America and the Caribbean (with the exception of Bolivia) along with several Southeast Asian countries showed a predominant daughter preference. Son preference was more prevalent in Southern Asia, Western Asia, and Northern Africa [45]. Individual studies from Egypt, Nepal, and China have reported a strong preference for sons over daughters [45-47]. Of the 28 countries in sub-Saharan Africa, which were part of the review son preference was seen in 16 countries. This review demonstrated that son preference was not predominant across countries and daughter preference was common in many countries [45]. among the countries from South East Asia region a strong preference for sons has been observed in India, China and South Korea [48].

New research from the UK suggests that a baby’s sex is linked to his or her mother’s diet around the time of conception and the finding may explain why fewer boys are born nowadays in the industrialized world, including the UK and the US.

The study is the work of researchers at the Universities of Exeter and Oxford and is published today in the *Proceedings of the Royal Society B: Biological Sciences*.

The researchers found a strong link between the consumption of a high energy diet around the time of conception and giving birth to sons.

Over the last four decades the birth rate for boys has been declining steadily in industrialized countries including the UK, the US and Canada. The decline is small but consistent, at around one in 1,000 births a year, said the researchers.

For the study, lead author Dr Fiona Mathews of the University of Exeter and colleagues investigated the diets of 740 first time mothers living in the UK who did not know the sex of their unborn child. The mothers to be gave information about their eating habits before and around conception and during the early months of their pregnancy.

Gender preference has been shown to be influenced by women's educational position and job. Mothers' education, according to a study by the International Center for Research on Women (ICRW), is the single most important factor in lowering son preference [19]. A woman's education may alter her opinion of a daughter's function in the household and reduce her preference for sons. However, it has been found that women who have received education beyond elementary school, such as secondary or higher education, have a shift in their perception of sons as the sole source of economic and social support [20]. Employed women will have a weaker son preference since they will view having a girl to be on par with having a boy in terms of providing financial stability to the family.

However, the situation regarding son preference in India is alarming, which is frequently associated with the neglect and death of millions of females through infanticide, sex selective abortions, improper nutrition, and lack of medical care[5]. India is a land of diversity with different religions, regions, and population groups across India showing a vast variance in their beliefs and preferences. A cultural divide exists between North and South Indian states. In North India exogamous marriage system favor strong patriarchal value and lower female autonomy compared to South India. High levels of gender discrimination against females have been reported in Northern and Western states of India [49].

A family is the most fundamental unit in the human society. The household size and its composition are an important aspect of the family, and the society at large. A balanced sex ratio plays a vital part in bringing out, and maintaining a stable society. People in India exhibit a strong gender preference for male child and this discrimination or prejudice continues in spite of

socio-economic development and higher growth rates. The preference for sons has been associated with preferential abortion of female fetuses and even to female infanticide.

Conclusion

The current study showed that diet preference among mothers affects the gender of the baby as the results showed. Some mothers intentionally reported following special diet in order to have specific gender.

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