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The relationship between pregnancy rhinitis and parity, preconception atopy and maternal age, a study from Al Ahsa, Saudi Arabia

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ABSTRACT

Introduction: Allergic rhinitis has a high prevalence with significant morbidity and loss of patients' productivity. Its cardinal symptoms include nasal congestion, rhinorrhea, sneezing, and itching. **Aim:** Study the relationship between parity, preconception atopy, maternal age and pregnancy rhinitis in Al-Ahsa, SA. **Materials and methods:** This study was across-sectional study conducted among women who experienced pregnancy rhinitis in Al Ahsa, SA from July 2021 to October 2021. Participants completed a self-directed questionnaire that include; socio-demographic characteristics, characteristics of women before and during pregnancy and Nasal Obstruction Symptom Evaluation. All women who are pregnant or have been pregnant were included in this study. Data analyzed using SPSS version 26 (SPSS, Armonk, NY:IBM Corp.). **Results:** 316 women were able to recruit with 34.2% being 19 – 25 years. The prevalence of pregnancy rhinitis was 39%. 38.6%, 14.2%, 20.6% and 3.8% comprising of mild, moderate and severe. The most common symptom of pregnancy rhinitis was sneezing (40.2%). Risk factors were atopy/skin allergy or eczema, being 18 – 25 years at first pregnancy, family history of allergic rhinitis (AR) and nasal problems during pregnancy. **Conclusion:** More than one-third of this study population had experienced pregnancy rhinitis. Among all of the assessed factors we found that pregnancy rhinitis is influenced by preconception atopy, maternal age at first pregnancy, family history, and nasal symptoms during pregnancy. However, parity was not.

Keywords: Rhinitis, pregnancy, parity, atopy, maternal age

1. INTRODUCTION

Among the allergic disorders, allergic rhinitis has a high prevalence with a significant morbidity and loss of patients' productivity. Its symptoms may



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lead to a significant limitation in daily life activities. Its cardinal symptoms include nasal congestion, rhinorrhea, sneezing, and itching, along with other symptoms affecting the eyes, mouth, and lungs. All patients with allergic rhinitis should undergo through a thorough history and physical examination (Kakli & Riley, 2016; Ciprandi et al., 2009). Pregnancy rhinitis is an important condition due to its association with obstructive sleep apnea syndrome and snoring during pregnancy (Ellegård, 2006). The association between allergic rhinitis and hormonal changes in menstruation, sexual stimulation, and pregnancy, has been already discovered, but the pathophysiology is unknown. However, there are some theories, and the most accepted theory is the estrogen theory. It is basically based on biopsies obtained from pregnant ladies. The results have shown an enlargement of the vascular bed, and an increase in the glands activity, leading to the swallowing of the mucosa. Those finding are explained by the nasal epithelium which is an estrogen targeting cells. This pathophysiology is specific for pregnancy, called pregnancy rhinitis (Caruso et al., 2000).

It was shown that nasal symptoms of pregnancy rhinitis commonly appear between the third and seventh months of pregnancy. It was noticed that those symptoms disappear within two weeks postpartum (Mohun, 1943). Worldwide, pregnancy rhinitis was found to show different prevalence in different countries. It was estimated to be around 18% in US and around 49% in Poland (Zacharisen, 2000). Among Saudi pregnant women, pregnancy rhinitis was estimated for 31%, which reflects that it is a common condition in Saudi Arabia (Albahkaly et al., 2016).

This study aims to study the relationship between parity, preconception atopy and maternal age and pregnancy rhinitis in ALAhssa, Saudi Arabia.

2. MATERIALS AND METHODS

This is a cross-sectional study conducted among women who experienced pregnancy rhinitis in Al Ahsa, Saudi Arabia. An online platform was used to distribute a self-directed questionnaire to women who are pregnant or have been pregnant. The questionnaire contains the following items; socio-demographic characteristics (i.e. age, nationality, marital status, etc.), characteristics of pregnant women during their pregnancy and before it, and Nasal Obstruction Symptom Evaluation (NOSE) instrument to measure nasal obstruction during pregnancy. Data collection started from July 2021 to October 2021.

Statistical Analysis

The statistical package for social science version 26 (SPSS, Armonk, NY:IBM Corp.) was used to analyze the data. Descriptive statistics were presented using numbers and percentages. The prevalence of pregnancy rhinitis has been compared with the maternal characteristics of women by using Chi-square test. P-value <0.05 was considered statistically significant.

3. RESULTS

In total, 316 women met the inclusion criteria. The most common age group was 19 – 25 years old (34.2%) with most women being of Saudi nationality (99.4%) and being married (96.8%). For their education, the majority had university or higher degrees (78.2%) and more than half (51.6%) were earning 5,000 – 10,000 SAR per month.

The characteristics of women before and during pregnancy were elaborated in Table 1. It can be observed that the prevalence of allergic rhinitis before pregnancy was 97.2% while the prevalence of atopy/skin allergy or eczema was 23.1%. More than two-thirds (67.7%) had 1 – 3 pregnancies. 71.5% indicated 19 – 25 years of age at first pregnancy while the most common age at the last pregnancy was 26 – 35 years old (40.5%). The proportion of women who were currently pregnant was 24.4% with 39% were in the third trimester. A positive family history for allergic rhinitis has been detected among 43.7%. In addition, 36% reported developing symptoms of pregnancy rhinitis during the first trimester.

Table 1 Characteristics of women before and during pregnancy (n=316)

| Variables | N (%) |
|--|-------------|
| Having allergic rhinitis before pregnancy | |
| Yes | 307 (97.2%) |
| No | 09 (02.8%) |
| Having atopy/skin allergy or eczema before pregnancy | |
| Yes | 73 (23.1%) |
| No | 243 (76.9%) |
| Number of pregnancies | |
| 1 – 3 | 214 (67.7%) |

| | |
|---|-------------|
| 4 – 6 | 89 (28.2%) |
| >6 | 13 (04.1%) |
| Age at first pregnancy | |
| <18 years | 36 (11.4%) |
| 19 – 25 years | 226 (71.5%) |
| 26 – 35 years | 46 (14.6%) |
| 36 – 45 years | 08 (02.5%) |
| Age at last pregnancy | |
| <18 years | 04 (01.3%) |
| 19 – 25 years | 108 (34.2%) |
| 26 – 35 years | 128 (40.5%) |
| 36 – 45 years | 64 (20.3%) |
| First pregnancy | 12 (03.8%) |
| Currently pregnant | |
| Yes | 77 (24.4%) |
| No | 239 (75.6%) |
| Current pregnancy trimester ⁽ⁿ⁼⁷⁷⁾ | |
| First trimester | 19 (24.7%) |
| Second trimester | 28 (36.4%) |
| Third trimester | 30 (39.0%) |
| Family history of allergic rhinitis | |
| Yes | 138 (43.7%) |
| No | 178 (56.3%) |
| In which stage in your pregnancy do you develop the symptoms ⁽ⁿ⁼¹⁷⁵⁾ | |
| First trimester | 63 (36.0%) |
| Second trimester | 32 (18.3%) |
| Third trimester | 24 (13.7%) |
| I cannot remember | 56 (32.0%) |

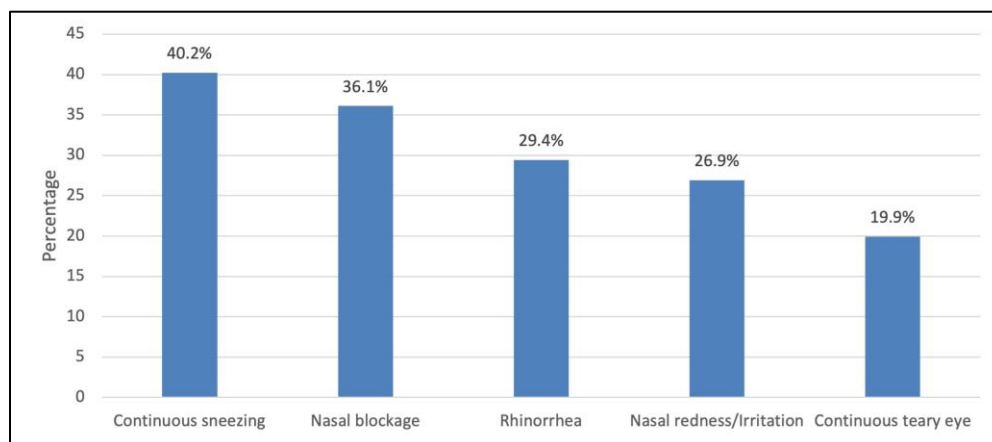


Figure 1 Nasal problems during pregnancy

Based on the results, it was revealed that the total NOSE score was 26.9 (SD 28.4) with 38.6% having nasal obstruction. With regards to the severity of nasal obstruction, 20.6% were severe and 3.8% were extremely severe. In Figure 1, the most common symptom of nasal problems during pregnancy was continuous sneezing (40.2%), followed by nasal blockage (36.1%) and rhinorrhea (29.4%).

Figure 2 showed the trend of symptoms experienced with different pregnancy periods. It was revealed that the trend of pregnancy symptoms decreased as the number of pregnancies increased with 21.2% reporting experiencing the symptoms at first pregnancy with cases declining after the sixth pregnancy (2.8%). In Figure 3, the prevalence of pregnancy rhinitis was 39% while the rest were normal (61%).

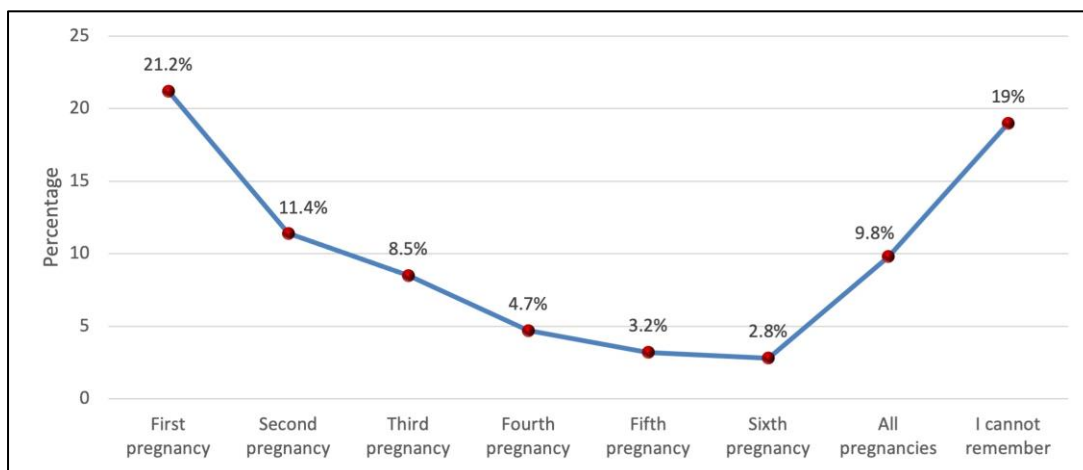


Figure 2 Pregnancy period when symptoms developed

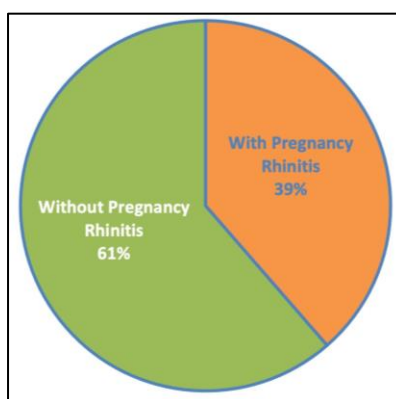


Figure 3 Prevalence of pregnancy rhinitis

We used the Chi-square test in Table 2 to determine if there is a significant relationship between the prevalence of maternal rhinitis in regards to the characteristics of women before and during pregnancy. Based on the results, it showed that the prevalence of maternal rhinitis was significantly more common among those with atopy/skin allergy or eczema before pregnancy ($p < 0.001$), those who were 18 – 25 years old at first pregnancy ($p = 0.016$), those who currently pregnant ($p = 0.001$) those with a family history of AR ($p = 0.024$), those with nasal problems during pregnancy such as nasal redness/irritation ($p < 0.001$), continuous sneezing ($p < 0.001$), rhinorrhea ($p < 0.001$), nasal blockage ($p < 0.001$) and continuous teary eye ($p < 0.001$) while the prevalence of pregnancy rhinitis was significantly less common among those in more than 45 years of age ($p = 0.016$).

Table 2 Relationship between Pregnancy Rhinitis and the characteristics of women before and during pregnancy (n=316)

| Factor | Pregnancy Rhinitis (PR) | | P-value § |
|---------------|-----------------------------|--------------------------------|-----------|
| | With PR N (%) (n=122) | Without PR N (%) (n=194) | |
| Age in years | | | |
| 19 – 25 years | 34 (27.9%) | 74 (38.1%) | 0.016 ** |
| 26 – 35 years | 44 (36.1%) | 50 (25.8%) | |
| 36 – 45 years | 39 (32.0%) | 49 (25.3%) | |
| >45 years | 05 (04.1%) | 21 (10.8%) | |

| | | | |
|--|-------------|-------------|-----------|
| Having Allergic rhinitis before Pregnancy | | | |
| Yes | 118 (96.7%) | 189 (97.4%) | 0.715 |
| No | 04 (03.3%) | 05 (02.6%) | |
| Having atopy/skin allergy or eczema before pregnancy | | | |
| Yes | 42 (34.4%) | 31 (16.0%) | <0.001 ** |
| No | 80 (85.6%) | 163 (84.0%) | |
| Number of pregnancy | | | |
| 1 – 3 | 80 (65.6%) | 134 (69.1%) | 0.792 |
| 4 – 6 | 37 (30.3%) | 52 (26.8%) | |
| >6 | 05 (04.1%) | 08 (04.1%) | |
| Age at first pregnancy (years) | | | |
| <18 | 18 (14.8%) | 18 (09.3%) | 0.016 ** |
| 18 – 25 years | 75 (61.5%) | 151 (77.8%) | |
| 26 – 35 years | 24 (19.7%) | 22 (11.3%) | |
| 36 – 45 years | 05 (04.1%) | 03 (01.5%) | |
| Age at last pregnancy (years) | | | |
| <18 | 0 | 04 (02.2%) | 0.118 |
| 18 – 25 years | 36 (30.0%) | 72 (39.1%) | |
| 26 – 35 years | 57 (47.5%) | 71 (38.6%) | |
| 36 – 45 years | 27 (22.5%) | 37 (20.1%) | |
| Currently pregnant | | | |
| Yes | 40 (32.8%) | 37 (19.1%) | 0.006 ** |
| No | 82 (67.2%) | 157 (80.9%) | |
| Current pregnant trimester | | | |
| First trimester | 09 (22.5%) | 10 (27.0%) | 0.776 |
| Second trimester | 16 (40.0%) | 12 (32.4%) | |
| Third trimester | 15 (37.5%) | 15 (40.5%) | |
| Family history of allergic rhinitis | | | |
| Yes | 63 (51.6%) | 75 (38.7%) | 0.024 ** |
| No | 59 (48.4%) | 119 (61.3%) | |
| Nasal problems during pregnancy * | | | |
| Nasal redness/irritation | 68 (55.7%) | 17 (08.8%) | <0.001 ** |
| Continuous sneezing | 86 (70.5%) | 41 (21.1%) | <0.001 ** |
| Rhinorrhea | 71 (58.2%) | 22 (11.3%) | <0.001 ** |
| Nasal blockage | 88 (72.1%) | 26 (13.4%) | <0.001 ** |
| Continuous teary eye | 39 (32.0%) | 24 (12.4%) | <0.001 ** |

*Variable with multiple response answers. AR – Allergic Rhinitis.

§P-value has been calculated using Chi-square test.

** Significant at p<0.05 level.

4. DISCUSSION

This study is carried out to understand the relationship between pregnancy rhinitis and parity, preconception atopy, and maternal age. This is, to our knowledge, the first study in Saudi Arabia that evaluated whether the parity, preconception atopy, and maternal age had a direct association with rhinitis during pregnancy. The findings of this study are important to the literature since pregnancy rhinitis greatly affected women’s quality of life and it could also affect fetal development. The prevalence of pregnancy

rhinitis was 39%. Among them, a severe symptom was experienced by 20.6% and 3.8% experienced extremely severe symptoms other women experienced either mild (38.6%) or moderate symptoms (14.2%). This prevalence is consistent with the paper of Albahkaly et al., (2016) They found out that the prevalence of pregnancy rhinitis was detected among 31.2% with 18.2% suffering severe symptoms, 46.8% were moderate and 35% were mild. Similarly, the incidence of pregnancy rhinitis in Poland was 39% and many women experienced the symptoms during the 13th and 21st week of gestation (Dzieciolowska-Baran et al., 2013) with similar findings reported in Australia (Powell et al., 2015). However, in Malaysia, the incidence of pregnancy rhinitis was higher with 53.3%. Although the reported sample size was small with only 30 pregnant women which could be the turning point (Indirani et al., 2013).

Data in this study revealed that having atopy or eczema before pregnancy, age at first pregnancy, and family history of AR are the risk factors for developing pregnancy rhinitis. However, parity and previous history of AR were not strong predictors of developing pregnancy rhinitis whereas being older age likely to be more resistant against pregnancy rhinitis. Several papers reported conflicting results with regards to the risk factors of pregnancy rhinitis. For example, in a study by Powell et al., (2015) they observed that the increase in anxiety symptoms was directly associated with pregnancy rhinitis but there was no direct impact with perinatal outcomes. Another study published by Shinohara et al., (2007) found an association of AR between the mother and their offspring. Accordingly, they found out that children whose mothers had any AR symptoms during early pregnancy showed a significantly higher adjusted odds ratio for the onset of AR in their children. However, late pregnancy showed no effect on the symptoms of AR. This is almost per our study, as we found current pregnancy has a direct association with the developing pregnancy rhinitis but without any relation to their offspring. In France, they found an association between pregnancy allergic rhinitis, wheezing, and atopic dermatitis, and meat intake. They further explained that preconceptional and prenatal consumption of a certain type of food may provide some protection against wheezing, asthma and allergic rhinitis, while high maternal meat consumption before pregnancy could be associated with increased risk of allergic rhinitis, wheezing, and atopic dermatitis among young children (Baiz et al., 2019).

In our study, the presence of nasal problems including nasal redness/irritation, continuous sneezing, rhinorrhea, nasal blockage, and the continuous teary eye was also determined as the risk factors of developing pregnancy rhinitis. This is also similarly reported by Albahkaly et al., (2016) according to their results, pre-existing allergic diseases such as nasal pruritus, sneezing, congestion, and postnasal drip were markedly associated with developing pregnancy rhinitis while in Iran, they found out that there was a significant relationship between pregnancy rhinitis and asthma (Fazel et al., 2021). Pregnant women who are showing a sign of nasal problems should consult their physician immediately. The burden of this disease could influence their pregnancy along with their mental health as such Albahkaly et al., (2016), suggested that pregnancy rhinitis symptoms should be taken into consideration during prenatal follow-ups. This will have a great reprieve of the burden of these bother some symptoms on pregnant women.

Moreover, some characteristics of women before and during pregnancy could influence the developing rhinitis during pregnancy. For example, we noted that the prevalence of AR before pregnancy was relatively higher with 97.2%. We also noticed that around one-fourth (23.1%) of the subjects experienced atopy or eczema before pregnancy with a family history of AR account for 43.7%, of whom nearly 40 percent develop the symptoms at the first trimester during first pregnancy (21.2%) or second pregnancy (11.4%). This is contrary to the report of Powell et al., (2015) where they indicated that the symptoms mostly occurred at the 13th to 21st weeks of gestation while in a report done by Indirani et al., (2013) most symptoms occurred during the 3rd quarter of pregnancy.

5. CONCLUSION

During pregnancy, rhinitis was detected in more than one-third of the population. Preconception atopy, maternal age at first pregnancy, family history, and nasal symptoms during pregnancy were the influential factors of pregnancy rhinitis but parity was not. Attending physicians should be more proactive regarding the symptoms of pregnancy rhinitis. The education provided by the doctor during the prenatal visit should include information about pregnancy rhinitis since it affects significantly their quality of life and may eventually impact fetal development.

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Ethical approval

Study approval was obtained from research ethics committee at college of medicine, King Faisal University, Al-Ahsa. Saudi Arabia on January 2021 with ethical approval number (2020 - 12 - 21).

Author Contributions

All the authors contributed evenly with regards to data collecting, analysis, drafting and proofreading the final draft.

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Conflict of interest

The authors declare that there are no conflicts of interest.

Data and materials availability

All data associated with this study are present in the paper.

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