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KNOWLEDGE AND AWARENESS ON THE IMPACT OF NICOTINE EXPOSURE THROUGH PASSIVE SMOKING AMONG PREGNANT WOMEN - A SURVEY

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ABSTRACT

Nicotine has a prominent effect on neurotransmitter function in adults but it desensitizes the functions when prenatally exposed to the fetus. Nicotine exposure has a direct impact on placental development. It is one of the most modifiable causes of mortality and morbidity during pregnancy for both mother and the fetus. There are various negative effects of nicotine exposure on the fetus and newborn. There are various factors like geographic conditions, socio- economic status, culture, educational status, etc that play an important role in the prevalence and exposure of nicotine among pregnant women. The aim of this study is to determine the prevalence and association of nicotine impact among first trimesters in pregnant women. A questionnaire was prepared and circulated through an online portal among women of various age groups. Majority of them were pregnant women. The data collected from the questionnaire were tabulated and

analysed using SPSS software (version 20) by IBM. The survey was mostly taken up by pregnant women of various socio economic status. The data collection was done during the year 2020. The data analysis was done during the time period of April - May 2020. There was a total prevalence of 33% exposure of nicotine among women. 64.91% of pregnant women were aware of the harmful effects of passive smoking while 35.09% were not aware. Majority of the participants in the study were aware of the harmful effects of passive smoking during pregnancy. From this study we can conclude that nicotine has severe effects on pregnant women and the fetus especially during the first trimester. More awareness must be created about the harmful effects of nicotine exposure during pregnancy to the general public.

Keywords: Tobacco, smoking, nicotine, women, pregnancy, exposure, health problems

INTRODUCTION

Smoking is one of the serious health threats among the population. It is the predominant risk factor for many major diseases such as cardiovascular disease, stroke, cancer, etc. The prevalence of smoking is steadily increasing among the developing countries than many developed countries. Apart from active smoking passive smoking or second hand smoking is also a major complication seen among the population. In general similar to active smoking, passive smoking also affects the individuals who are exposed to it. Among that pregnant women who are exposed to passive smoking are under serious health concern as it causes several problems such as miscarriages, still birth, impairs fetal development, leads to certain birth defects, etc. Cigarette and beedi contains several harmful chemical compounds such as tar, carbon monoxide, nicotine, etc. Among all nicotine is the major substance which causes several health problems. Nicotine is an alkaloid and potent stimulant. Exposure to nicotine is one of the most modifiable causes of mortality and morbidity during pregnancy for both mother and fetus **[1]**. Nicotine exposure has a direct impact on the placental development which has major effects like fetal growth restriction, neurological developmental problem, premature delivery,etc. **[2]**. Cigarette smoke is one of the major forms of nicotine exposure **[3]**. Nicotine, carbon dioxide, etc. are likely to cause perinatal damage **[4]**. During pregnancy, the nicotine that enters the mother's body crosses the placental and blood brain barriers and it is also found in the fetal in higher concentration than in maternal tissues **[5]**. It is found that nACHRs are present very early in neuronal development

and it also leads to the activation of apoptosis and mitotic abnormalities **[6]**. Chronic exposure of nicotine during pregnancy can have major effects in the development of the fetal brain and its functions **[1]**. It alters the timing and the intensity of the brain development. The infants which were prenatally exposed to nicotine had lower levels of epinephrine and norepinephrine in blood at birth.

Maternal smoking is also associated with increased risk of Sudden Infant Death Syndrome **[7]**. An increased incidence of auditory- cognitive deficits that has an effect in understanding speech was reported **[8]**. Hence, complete abstinence from all forms of nicotine is advised to pregnant women entirely during gestation and early cessation from the first trimester. Although the negative effects of nicotine exposure on the fetus and the newborn is known, the habit still remains a great issue worldwide. However, there are various factors like geographic conditions, socio- economic status, culture, educational status, etc which should be taken into consideration while discussing the prevalence of exposure, awareness, etc. **[9]**.

Previously, numerous morphometric studies **[10–13]** and in vivo animal study **[14]** and genetic study **[15]**, bioinformatics study **[16]**, anthropometric study **[17]**, survey studies **[18–23]** and review **[24]** have been conducted by our team over the past 5 years. Now we are focussing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community. The aim of this study is to determine the knowledge and awareness of nicotine exposure through passive smoking among pregnant women.

MATERIALS AND METHODS

The study was based on an online questionnaire which included the female population who are pregnant women in the Chennai population. The total responses collected was 57. The study was approved by the Institutional Research Board. The data collection was done by preparing a self structured standard questionnaire containing necessary information on smoking, passive smoking, awareness of nicotine exposure during pregnancy, harmful effects of smoking, complications of smoking on fetus, etc. The questionnaire also included the demographic details like name, age, occupation, gestation period if pregnant, etc. The questionnaire prepared was circulated in an online survey portal system. A total of 57 responses were collected through online questionnaires from women ranging from a wide age group of 18 - 55. The questionnaire

revolved around various professionals like bankers, software engineers, teachers, students, artists, dentists, etc. This survey included women of various socio- economic status with various environmental backgrounds. The data collected from the questionnaire was imported to the SPSS software and the variables were defined. The statistical analysis was done using SPSS software version 23.0. The method of analysis used was descriptive statistics and frequency distribution was used to represent data. Chi square test was used to find the association between the variables. The data collection was done during the year 2020. The data analysis was done during the time period of April - May 2020.

RESULTS

In this survey among the 57 pregnant women, 21.1% were in the first trimester, 33.3% were in the second trimester and 45.6% were in the third trimester of pregnancy **[Figure 1]**. When enquired about the awareness of passive smoking among the women participants, 52.63% were aware of passive smoking while 47.37% were not aware of passive smoking. Majority of the participants in the study were aware of passive smoking **[Figure 2]**. When enquired about the awareness on harmful effects of passive smoking during pregnancy, 64.91% were aware of the harmful effects of passive smoking while 35.09% were not aware. Majority of the participants in the study were aware of the harmful effects of passive smoking during pregnancy **[Figure 3]**. When enquired about the awareness of harmful chemical compound called nicotine in cigarettes/ beedi, 40.35% were aware of nicotine while 59.65% were not aware of nicotine. Majority of the participants in the study were not aware of nicotine in cigarette/ beedi **[Figure 4]**. When the awareness on the effect of nicotine exposure through passive smoking during pregnancy in developing baby's health was analysed, 35.09% were aware of the effect of nicotine through passive smoking while 64.91% were not aware. Majority of the participants in the study were not aware that nicotine exposure through passive smoking during pregnancy affects the developing baby's health **[Figure 5]**. When enquired if their husbands were smokers, 80.70% of the pregnant women participated in the study responded that their husbands were smokers while 19.30% of the women responded that their husbands were non- smokers **[Figure 6]**. When the association between age and awareness on the effects of nicotine exposure through passive smoking during pregnancy was analysed, in the age group of 20 - 30 years,

7.02% responded that nicotine exposure during pregnancy can cause miscarriage, 5.26% responded that it will cause still birth, 1.75% responded as several birth defects, 10.53% responded that baby's development entirely will be affected and 15.79% responded that all the above can occur due to nicotine exposure during pregnancy. In the age group of 31 - 40 years, 12.28% responded that nicotine exposure during pregnancy can cause miscarriage, 3.51% responded that it will cause still birth, 7.02% responded as several birth defects, 8.77% responded that baby's development entirely will be affected and 14.04% responded that all the above can occur due to nicotine exposure during pregnancy. In the age group of above 40 years, 1.75% responded that nicotine exposure during pregnancy can cause miscarriage, 1.75% responded that it will cause still birth, 1.75% responded as several birth defects, 5.26% responded that baby's development entirely will be affected and 3.51% responded that all the above can occur due to nicotine exposure during pregnancy. Among the 3 categorised age groups 15.79% of pregnant women of the age group 20-30 years responded all the above than women in other age groups this indicates that there was a difference in the awareness but was not statistically significant. Chi square test showed p=0.859 (p>0.05) indicating statistically not significant, proving there was no association between age and awareness on the effects of nicotine exposure through passive smoking during pregnancy **[Figure 7]**. When the association between the trimester of the pregnant women and awareness on the effects of nicotine exposure through passive smoking during pregnancy was analysed, among the respondents in first trimester, 5.26% responded that nicotine exposure can cause miscarriage, 1.75% responded that it will cause still birth, 1.75% responded as several birth defects, 5.26% responded that baby's development entirely will be affected and 7.02% responded that all the above can occur due to nicotine exposure during pregnancy. Among the respondents in second trimester, 7.02% responded that nicotine exposure can cause miscarriage, 3.51% responded that it will cause still birth, 1.75% responded as several birth defects, 7.02% responded that baby's development entirely will be affected and 14.04% responded that all the above can occur due to nicotine exposure during pregnancy. Among the respondents in third trimester, 8.77% responded that nicotine exposure can cause miscarriage, 5.26% responded that it will cause still birth, 7.02% responded as several

birth defects, 12.28% responded that baby's development entirely will be affected and 12.28% responded that all the above can occur due to nicotine exposure during pregnancy. Among the three trimesters, 14.04% of women in the second trimester responded as all the above than women in other trimesters, this indicates that there was a difference in awareness but was not statistically significant. Chi square test showed p=0.972 (p>0.05) indicating statistically not significant, proving there was no association between pregnancy trimester and awareness on the effects of nicotine exposure through passive smoking during pregnancy **[Figure 8]**. When the association between age and status of nicotine exposure was analysed, in the age group of 20 - 30 years, 19.30% were exposed to nicotine while 21.05% were not exposed to nicotine. In the age group of 31 - 40 years, 19.30% were exposed to nicotine while 26.30% were not exposed to nicotine. About 12.28% of the respondents in the age group of above 40 were exposed to nicotine while 1.75% were not exposed to nicotine. Chi square test showed p=0.076 (p>0.05) indicating statistically not significant, proving there was no association between age and status of nicotine exposure during pregnancy **[Figure 9]**. When the association between age and awareness on the abortion due to nicotine exposure during pregnancy was analysed, 22.81% of respondents in the age group of 20 - 30 years were aware of abortion due to nicotine exposure during pregnancy and 17.54% were not aware, In the age group of 31 - 40 years, 26.32% were aware and 19.30% were not aware. About 7.02% of women in the age group of above 40 years were aware of abortion due to nicotine exposure and 7.02% were not aware. Among the 3 categorised age groups 22.81% of pregnant women of the age group 20-30 years responded that they were aware than women in other age groups this indicates that there was a difference in the awareness but was not statistically significant. Chi square test showed p=0.928 (p>0.05) indicating statistically not significant, proving there was no association between age and awareness on the abortion due to nicotine exposure during pregnancy **[Figure 10]**.

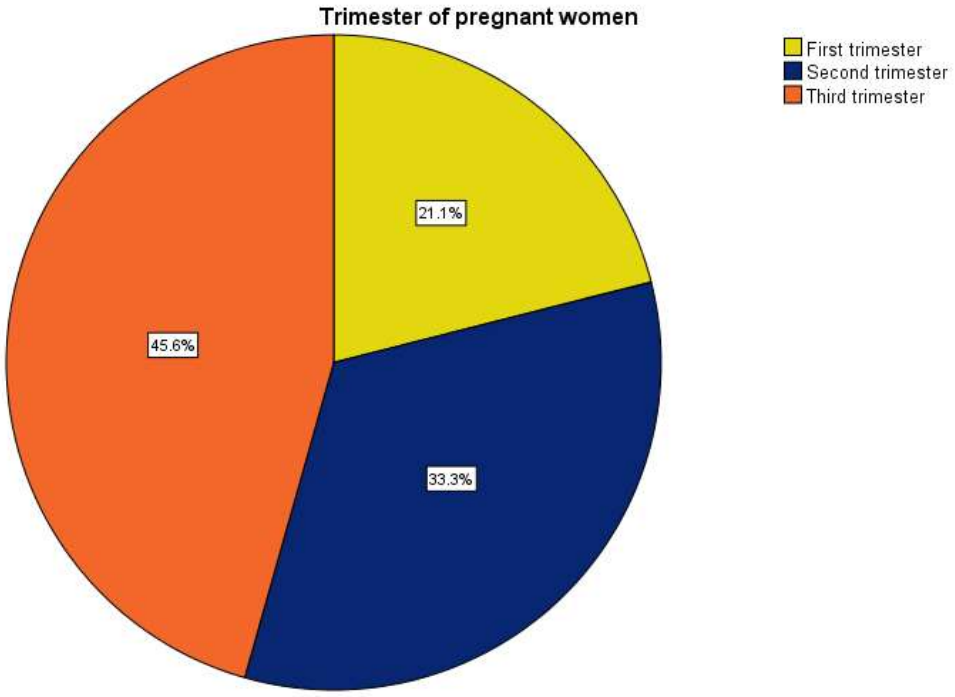

Figure 1: Pie chart showing the percentage distribution of pregnancy status of women population in their trimesters. 21.1% of pregnant women were in the first trimester, 33.3% were in the second trimester and 45.6% were in the third trimester. More pregnant women were in their third trimester of pregnancy.

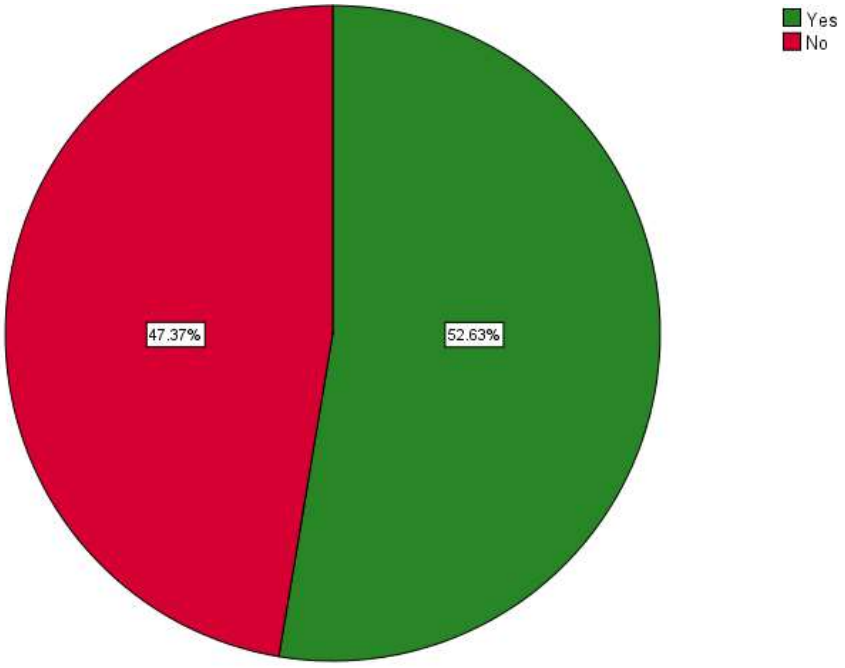

Figure 2: Pie chart showing the percentage distribution of awareness on passive smoking among the women participants. 52.63% were aware of passive smoking while 47.37% were not aware. Majority of the participants in the study were aware of passive smoking.

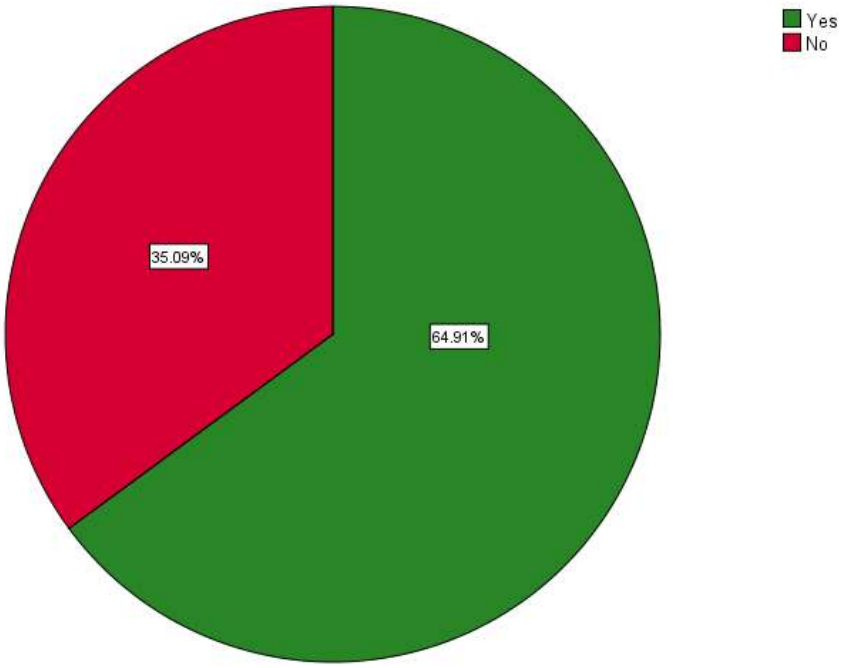

Figure 3: Pie chart showing the percentage distribution of awareness on harmful effects of passive smoking during pregnancy. 64.91% were aware of the harmful effects of passive smoking while 35.09% were not aware. Majority of the participants in the study were aware of the harmful effects of passive smoking during pregnancy.

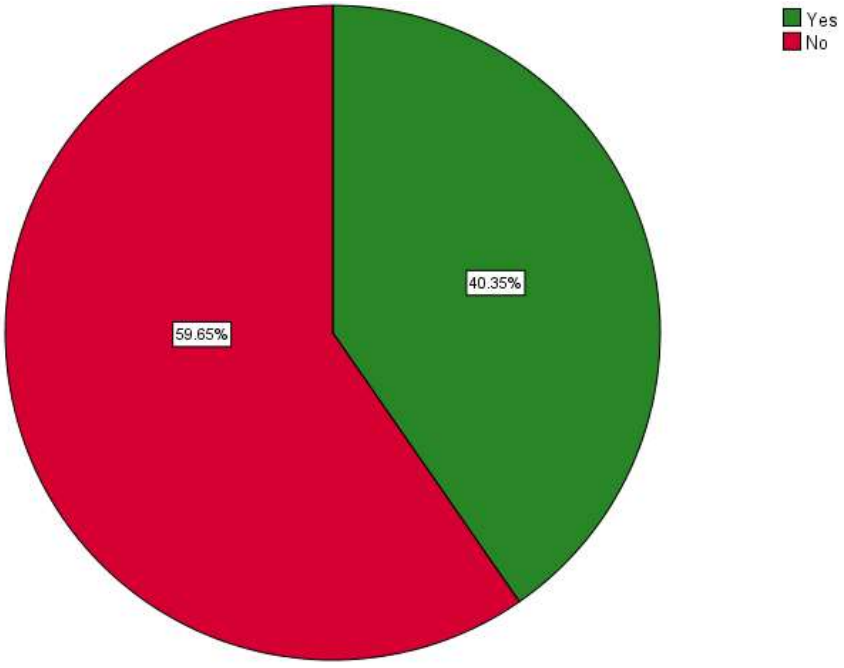

Figure 4: Pie chart showing the percentage distribution of awareness on the harmful chemical compound nicotine present in cigarettes/ beedi. 40.35% were aware of nicotine while 59.65% were not aware of nicotine present in it. Majority of the participants in the study were not aware of nicotine in cigarette/ beedi.

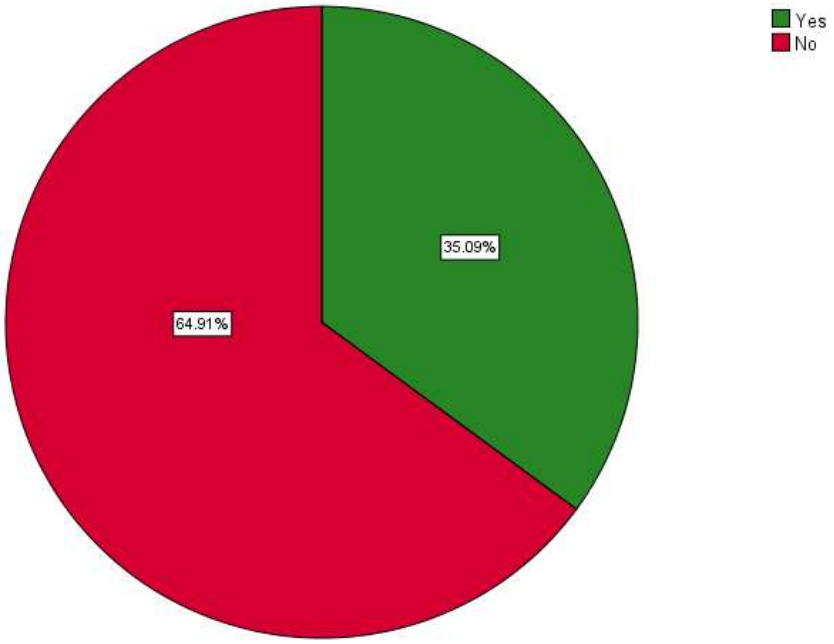

Figure 5: Pie chart showing the percentage distribution of awareness on the effect of nicotine exposure through passive smoking during pregnancy in developing baby's health. 35.09% were aware of the effect of nicotine through passive smoking while 64.91% were not aware. Majority of the participants in the study were not aware that nicotine exposure through passive smoking during pregnancy affects the developing baby's health.

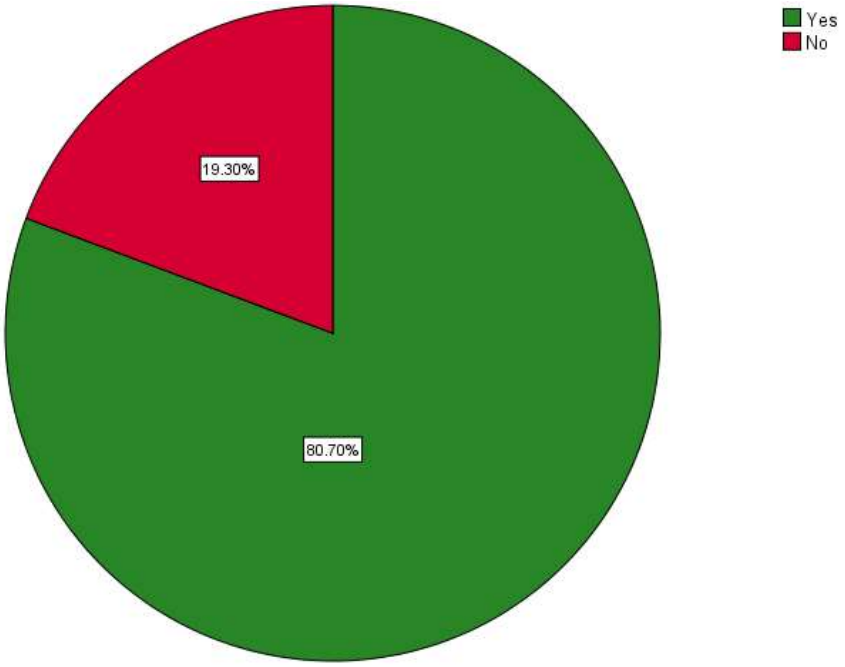

Figure 6: Pie chart showing the percentage distribution of smoking status of the husbands of the women participants. 80.70% were smokers while 19.30% were non- smokers. Majority of the husbands of the women participants in the study were smokers.

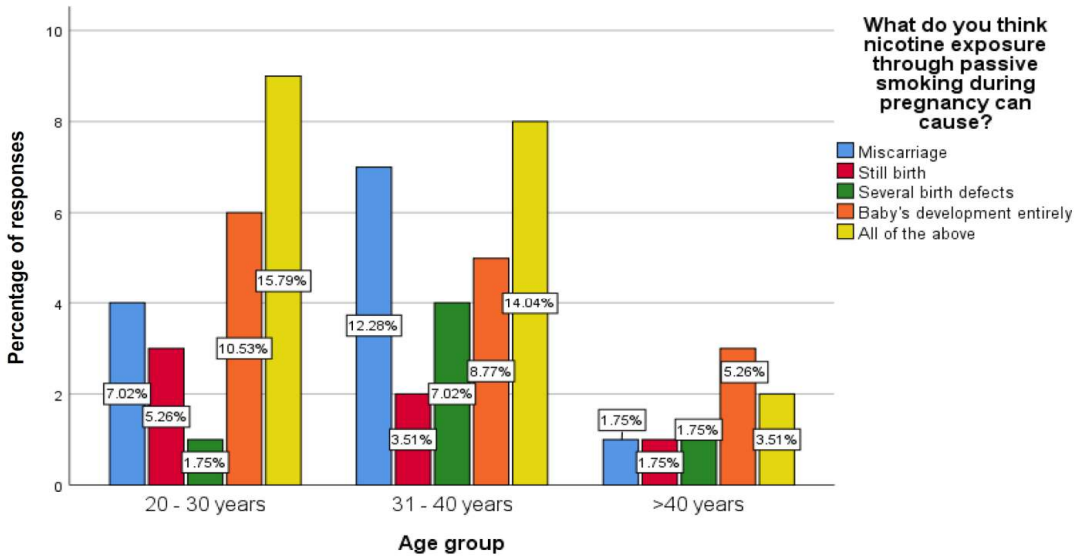

Figure 7: Bar graph showing the association between age and awareness on the effects of nicotine exposure through passive smoking during pregnancy. X-axis represents age groups and y-axis represents the percentage of responses of pregnant women. Pregnant women of the age group 20-30 years responded all the above than women in other age groups, this indicates that there was a difference in the awareness but was not statistically significant. Chi square test showed p=0.859 (p>0.05) indicating statistically not significant, proving there was no association between age and awareness on the effects of nicotine exposure through passive smoking during pregnancy.

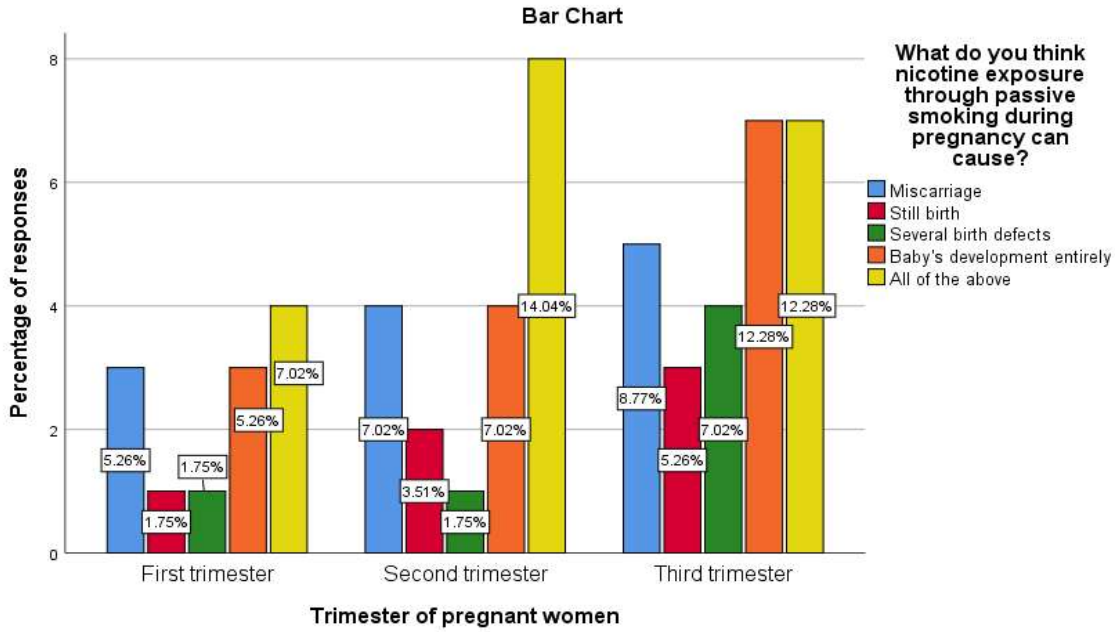

Figure 8: Bar graph showing the association between the trimester of the pregnant women and awareness on the effects of nicotine exposure through passive smoking during pregnancy. X-axis represents the trimester of the pregnant women and the y-axis represents the percentage of responses of pregnant women. Among the three trimesters, women in the second trimester were more aware of the effects of nicotine exposure during pregnancy than women in other trimesters, this indicates that there was a difference in the awareness but was not statistically significant. Chi square test showed p=0.972 (p>0.05) indicating statistically not significant, proving there was no association between pregnancy trimester and awareness on the effects of nicotine exposure through passive smoking during pregnancy.

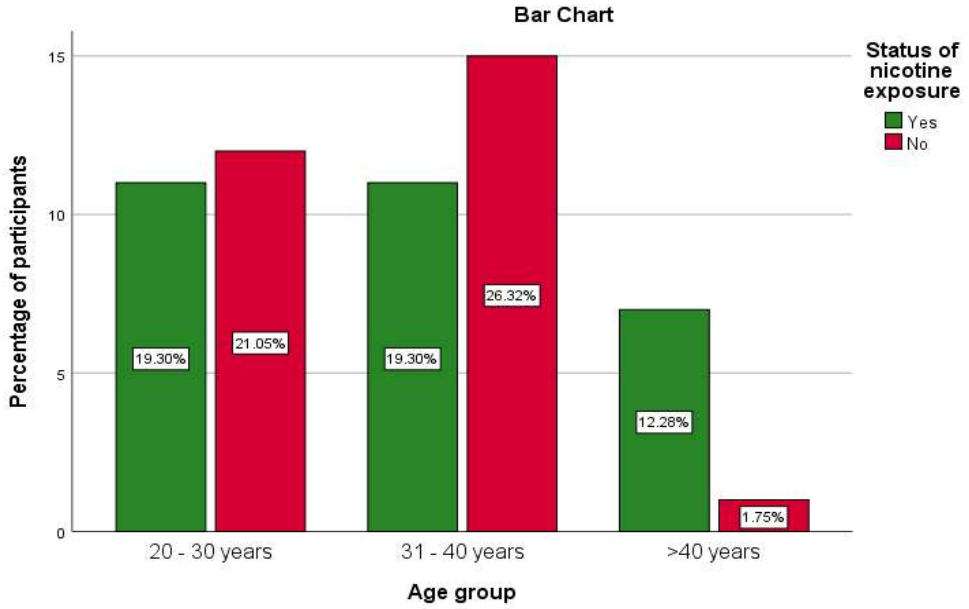

Figure 9: Bar graph showing the association between age and status of nicotine exposure during pregnancy among the participants. X-axis represents age groups and y-axis represents the percentage of participants. Among the three categorized age groups, women in the age group 20-30 and also in 31 - 40 years were exposed to nicotine, relatively more when compared with women above 40 years, this indicates that there was no much difference in the nicotine exposure level through passive smoking among the pregnant women and was not statistically significant. Chi square test showed p=0.076 (p>0.05) indicating statistically not significant, proving there was no association between age and status of nicotine exposure during pregnancy as all the pregnant women of all ages are exposed to nicotine through passive smoking.

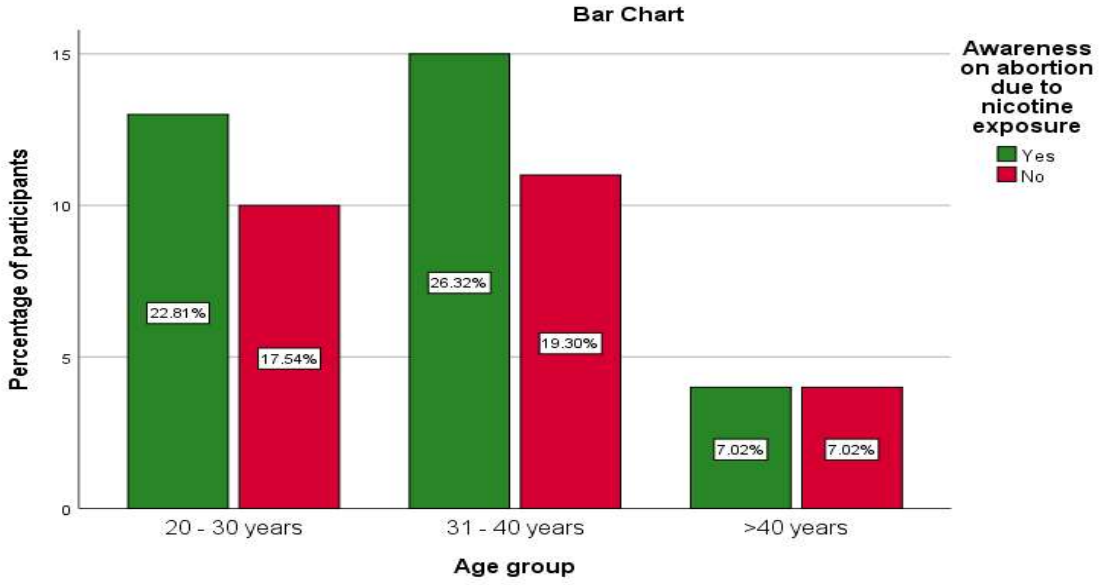

Figure 10: Bar graph showing the association between age and awareness on the abortion due to nicotine exposure during pregnancy. X-axis represents age groups and y-axis represents the percentage of responses of pregnant women. Among the 3 categorised age groups, pregnant women of the age group 31-40 years are more aware of nicotine exposure leads to abortion, than women in other age groups this indicates that there was a difference in the awareness but was not statistically significant. Chi square test showed p=0.928 (p>0.05) indicating statistically not significant, proving there was no association between age and awareness on the abortion due to nicotine exposure during pregnancy

DISCUSSION

Nicotine has a prominent effect on neurotransmitter function in adults on the other hand it desensitizes their functions in prenatally exposed fetus and infants **[2]**. Yet another major discrepancy is low birth weight, which is associated with increased morbidities and mortalities in the fetus. Several other effects like respiratory distress, feeding intolerance, low neurodevelopment, etc are also noticed **[25]**. There are numerous mechanisms that included the placental vasoconstriction that is induced due to nicotine **[26]**. Nicotine, along with carbon monoxide acts on mitochondrial function in the fetus **[27]**. During pregnancy, the pancreatic beta cells in the mother increases in number and also the mother's glucose sensitivity increases in response to higher levels of prolactin and lactogen. This results in increased insulin secretion **[28]**. The higher level of insulin secretion increases the appetite and promotes transport of glucose across the placenta **[29]**. This causes impaired glucose tolerance in the fetus which may become severe if the nicotine exposure continues even during lactation **[30]**. Nicotine exposure can also result in gestation diabetes which has a direct effect on the fetus.

Persistent maternal smoking throughout pregnancy was associated with increased childhood respiratory symptoms and reduced lung function **[31]**. carbon monoxide, a by-product of tobacco smoking and other tobacco products induces fetal hypoxia **[32]**. This may directly induce fetal growth failure. It can also indirectly affect the fetal growth through a negative influence through placenta **[20, 33]**. Smoking during pregnancy can also have an impact on fetal growth by suppression of placental growth hormone and fetal insulin like growth factor endocrine function **[23, 34]**.

Nicotine exposure has an impact by changing the intensity and timing of brain cell development and in the programming of neurodevelopmental events on a cellular level **[35]**. Other defects like serotonin defect, behavioural, learning and sensory development defects are also noticed **[2]**. In the present study we could observe the consequences of nicotine exposure during pregnancy. This study plays a major role in public health education. In this study, we could observe that the prevalence of nicotine exposure among women was low similar to the awareness. This is because of the considerations like geographic location, climate, socio economic status, educational status, environmental influence, etc.

CONCLUSION

From the present study we can conclude that though pregnant women are aware about passive smoking, still many of them are not completely aware of it. Moreover, the majority of pregnant women are not aware of the harmful effects of nicotine exposure during pregnancy and its effects on developing fetus. An in depth knowledge and clear awareness should be made on the effects of passive smoking and nicotine exposure among the female population. Thus the survey concludes that for pregnant women, exposure of nicotine through smoking is inevitable under several conditions at the present scenario of Indian socio-economic setup, but care and precautions must be taken to prevent or to minimize the exposure especially during pregnancy.

Acknowledgement

Nil

Author contributions

The first author contributed for the conception of the study, carried out the survey by collecting the data, acquisition of data and drafting the manuscript after performing the necessary statistical analysis. The second author contributed for guidance, supervision, aided in study design and revising it critically for important intellectual content. The third author made formatting and other alignment corrections and contributed in the final approval of the submitted version of the manuscript.

Conflict of interest

None declared.

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