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Association of low birth weight with environmental tobacco smoke (ETS) exposure among pregnant women.

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ABSTRACT… Objectives: To determine the association between low birth weight babies and environmental tobacco smoke (ETS) exposure during pregnancy and the factors related to it. **Study Design:** Case Control study **Setting:** Obstetrical and Gynecological Units of a Sir Ganga Ram Hospital, Lahore. **Period:** March 2016 to August 2017. **Material & Methods:** Babies born to mothers' aged between 20 to 35 years in all four Obstetrical and Gynecological units of a Sir Ganga Ram hospital, Lahore, were included. 150 low birth weight babies (LBW) born at term, fulfilling the exclusion and inclusion criteria were taken as cases and 150 normal weight babies born on same day were taken as controls. Mothers were interviewed on a semi structured and pretested questionnaire covering all variables using non- probability purposive sampling technique and the data was analyzed on SPSS Version 20.0. The difference of means was tested using independent t-test whereas difference of proportions was analyzed by using Pearson Chi -Square test. Odds Ratio of >2 was taken as significant. P value <0.05 was considered statistically significant. In order to adjust the effect of confounder data was stratified. **Results:** 110/150(73.3%) cases and 48/150(32%) controls were exposed to ETS with odds of low birth weight being 5.84 times higher among exposed mothers. Odds of having low birth weight was 3.55 times for ETS exposure at home than those not having home exposure. Ninety Six cases (64%) and 70(46.7%) controls had no knowledge about passive smoking. Only one third of all respondents had knowledge about Second Hand Smoke(SHS) while 110 exposed to ETS, only 09 had adequate knowledge about passive smoking with a significant difference in the knowledge among mothers of the cases and controls (p value 0.004, T score -2889). **Conclusion:** Mothers exposed to ETS had 5.84 odds of having LBW babies than unexposed, endorsing the association between the two particular when at home. Illiteracy, illiterate smoker husband and poor knowledge of mother about SHS and its hazards further escalated the situation. More researches are, therefore, required to evaluate the effects of passive smoking exposure in a low income country like Pakistan and steps should be taken to avoid it especially during pregnancy.

Key words: Environmental Tobacco Smoke, Knowledge, Low Birth Weight, Passive Smoking, Second Hand Smoke.

INTRODUCTION

Low birth weight (LBW), defined, as birth weight of less than 2500 gram (5 lb 80 oz) of babies irrespective of their gestation age, is a good summary of socio-economic status. The global prevalence of 14.6%, means that 20 million LBW infants are born each year, with three quarters of them are in South Asian and Sub-Saharan region. It can be a consequence of preterm birth (<37 weeks of gestation) or small for gestational age (SGA) babies even at term. The risk of death is 20 times more in LBW babies and it contributes to 60% to 80% of all neonatal deaths. LBW infants are at higher risk of early growth retardation, infection, developmental delay and death during infancy and childhood. Pakistan bears highest burden of the LBW ranging from 19% to 32% (urban vs rural prevalence respectively).[1,2]

There are many risk factors for LBW. Low birth weight may be the consequence of a variety of maternal risk factors such as severe anaemia; fetal and placental factors such as placental abruption, vaginal bleeding; socio-economic

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factors such as poverty are regarded as role players in etiology of LBW. Besides these, poor environmental conditions have gained much importance as a leading cause of LBW over the past few decades. Air pollutant, including tobacco smoke, are increasingly recognized as major contributers.[2,3] Active maternal smoking during pregnancy leading to poor fetal development, is well documented. However, second hand smoke (SHS) due to environmental tobacco smoke exposure (a combination of exhaled smoke from active smoker and smoke containing smoldering tobacco between puffs), is now recognized as major health hazard. Studies show that side stream tobacco smoke actually contains higher concentrations of certain toxic chemicals, including several cancer-causing agents, than does the mainstream smoke. Some compounds are 10 times more in side-stream than in mainstream smoke. It has been observed that passive smoking during pregnancy has a higher risk of poor fetal development (i.e., reduced birth weight and birth length), impaired lung functions, respiratory illness (e.g., asthma), and cognitive deficits (e.g., impaired intelligence, language skills and speech). Environmental tobacco smoke (ETS), contains more than 4,000 compounds, out of which at least 250 are knowingly toxic for human health; of larger concern are nicotine and carbon monoxide. Some of these chemicals (carbon monoxide, nicotine, poly aromatic hydrocarbons) can cross placenta and reduce the oxygen availability of fetus, thus causing hypoxia resulting in low birth weights, pre-term delivery and other complications of pregnancy.[3,4,5,6]

Tobacco smoking is primarily the habit of men and majority of women and children are passive smokers.[7] Many studies have revealed that prenatal exposure to ETS is responsible for spontaneous abortions, preterm deliveries, LBW and low APGAR scoring (less than 7) in first and fifth minute. Maternal exposure to toabacco during pregnancy can lead to trans-placental carcinogenesis and postnatal childhood cancers, such as lymphoma, leukemia and brain tumor. These children are also more likely to suffer from asthma, acute and chronic respiratory illnesses. Studies show that ETS exposure is associated with congenital malformations such as cleft lip, cleft palate, spina bifida, feet deformities, genitourinary, immune, cardiovascular, respiratory, and other organ-systems' anomalies.[4,5,6] Thus maternal exposure to tobacco smoke during pregnancy may create a population which may suffer from SHS associated diseases.[8] Various studies indicate that exposure of pregnant females and their young children to ETS are significant threats to health in low and middle income countries. Pakistan is one of low income countries having tobacco smoke exposure in non-smoking pregnant females as high as 50%. In developing countries (like Pakistan) additional risk factors such as malnutrition are more frequent and it is plausible that passive smoking will have a larger impact.[8]

Very little literature review and data on adult tobacco survey has been found regarding the current situation in Pakistan. According to Pakistan Demographic and Household Survey 2017-2018, 23% of ever-married men aged 15-49 years in Pakistan are more likely to use tobacco in any form than women, with most of men reporting use of cigarettes and 17% of them smoking more than five cigarettes per day, only 3% of the ever married women aged between 15-49 are active smokers.[9] The most common source of ETS during pregnancy was husband's smoking in the home followed by work place during last trimester of the pregnancy and up to 56% of non-smoking pregnant females are exposed to tobacco smoke with reduction in birth weight of their babies up to as much as 237g.[10,11,12,13,14]

Keeping in view the customary set up of our society, involuntary exposure to tobacco smoke by women and children is a hazard affecting them additionally, in already underprivileged fragments of the society. This is avoidable but requires quantification when attention is paid to it and large scale studies assessing the risk of SHS and knowledge are taken up since tobacco can be avoided in most of the circumstances. Maternal exposure to tobacco smoke during pregnancy may create a population at a greater risk for passive smoking associated diseases.

Low birth weight and intrauterine retardation are significant risk factors for childhood mortality and morbidity. Tobacco, its smoke are identified as one of the environmental factors affecting the birth weight of the fetus. No study conducted in Pakistan has shown the adverse effect of second hand exposure on birth weight of the fetus. Since tobacco smoke is avoidable in most of the circumstances, thus the following study aims to determine the effect of passive smoking on birth weight in country like Pakistan where tobacco is addiction of men leaving women and children as passive smokers.

MATERIAL & METHODS

This was a case control study conducted from March 2016 till August 2017. Babies born to mothers aged between 20 to 35 years in all four Obstetrical and Gynecological units of a Sir Ganga Ram hospital, Lahore, were included in the study. Alive, singleton baby born during the study period with birth weight less than 2.5 kg at term taken as "case" whereas baby born on same day with normal birth weight was taken as "control". The 1:1 case control study included 150 cases and 150 controls. Non-probability purposive sampling technique was adopted. The babies born to mothers who were smokers, short statured (height < 145 cm), hypertensive, diabetic, anemic and with bad obstetrical history were excluded from the study. Newborns with gross congenital abnormalities were also not included in the study. The mothers were interviewed on a semi structured and pretested questionnaire and the data analyzed on SPSS Version 19.0. Data was collected on a pre-tested questionnaire and observational checklist by the researcher herself using same questionnaire from the selected mothers in same tone and time to reduce intra-rater bias. Cases and controls weighed within 24 hours of delivery on scale pan with minimum clothing. The knowledge about passive smoking and its hazards questions was also be asked from the respondent asking her to choose one option from the list (only one option was true in the answers provided to her). Every correct answer was given score=1, false answer and undecided response was given zero score. Respondents scoring score >7 out of 10 were categorized as having adequate knowledge and those scoring below 7 out of were categorized as having inadequate knowledge. Exposure to tobacco smoke and SHS was defined as the self-reporting of exposure to ETS when hookah, bedi or cigarette is being smoked in her presence at least once daily during last trimester of the pregnancy.[12] Socio-economic status of the pregnant woman was defined low when her daily household income per day per individual was <$2 (320PKR).

Data Analysis

Statistical Package for Social Sciences (SPSS) version 20.0 was used for data entry and analysis. It was presented in form of tables. Descriptive analysis of numerical data (like age of the mother) expressed in means and standard deviation. Categorical variables (like low birth weight) were described in frequency and percentages. In bi-variate analysis, the difference of means was calculated using independent t-test whereas difference of proportions was examined using Pearson Chi -Square test. Odds Ratio of >2 was taken as significant and p value <0.05 at 95% confidence interval was considered statistically significant. In order to adjust the effect of confounder data was stratified. 110/150(73.3%) cases and 48/150(32%) controls were exposed to passive smoking. The odds of having low birth weight was 5.84 times in mothers exposed to passive smoking than unexposed. In order to adjust the effect of confounder such as parity, antenatal care, past obstetrical history, the data was stratified. Matching was done for maternal age and socio-economic status.

The study commenced after taking the permission from the institute. Full informed consent was taken from respondents and their confidentiality was ensured after taking the prior permission from the hospital authorities.

RESULTS

Total 300 mothers of 150 cases and 150 controls (1:1 for cases and controls) were included by non-probability purposive sampling technique.

Out of 150 responding mothers of cases 82

(54.7%) were aged up to 25 years, 36 (24%) aged 25-30 years and 32(21.5%) aged from 31-35 years. Among 150 controls 80(53.3%) aged up to 25 years, 39(26%) aged from 25-30 years and remaining 31 (14%) age ranged from 31-35 years. 52(34.7%) mothers of cases were employed and 98 out 150(65.3%) were house wives. Among controls' mothers, 34 (22.7%) were employed and remaining 116 (77.3%) were housewives. 43(28.7%) of cases' mothers were illiterate while 22 (14.7%) of control respondents didn't know how to read and write. Among the remaining cases' mothers 81(54%) had less than or equal to 10 years of formal schooling while 26(17.3%) had more than 10 years of formal schooling. 57(38%) of the controls' mothers education was less than or equal to 10 years of formal schooling while 71 (47.3%) had more than 10 years of formal schooling. Majority of the respondents for cases, 116 (77.3%), had low socio-economic status while 73(48.7%) of respondents for controls had low socio-economic status. (Table-I)

Out of 150 cases, 58(38.7%) fathers were illiterate, 75(50%) had < 10 years of formal schooling while remaining 17(11.3%) had more than 10 years of formal schooling. Among 150 controls, 52 (34.7%) fathers were illiterate, 80 (53.3%) had < 10 years of formal schooling while remaining 18(12%) had more than 10 years of formal schooling. (Table-II)

Fathers' of 116(77.3%) cases were smokers, and 65(56.7%) fathers of controls were smokers.
Out of 300,158 (52.7%) respondents mothers were exposed to ETS.

Among cases, 110 (73.3%) were born to mothers who had minimum exposure of at least one hour/ week to tobacco smoke during last trimester. Remaining 40 (26.7%) didn't have exposure to cigarette smoke. 48(32.0%) were exposed to passive smoking while 102(68.0%) were not exposed to tobacco smoke. The odds of having low birth weight babies was 5.84 times high in the mothers exposed to passive smoking than unexposed. (P-value 0.000,CI 3.542-9.646). (Table-III) 58/110 cases and 18/110 exposed control mothers were age < 25years.

Among 110,73 exposed cases mothers and 21/48 control mothers were unemployed with p value 0.008, 95% CI 0.196, 0.789. 89 of cases mothers were illiterate while 35/48 of exposed control mothers were literate with p value 0.0001, odd's ratio 11.4103 and 95% CI 5.153, 25.256. Among 110;71 exposed cases and 27/48 of exposed controls were from low socio-economic status with p value 0.324, 1.416 and 95%CI 0.709, 2.826. (Table-IV).

Among 110;95 exposed cases mothers had illiterate husband while 23/48 exposed control's husbands were also illiterate with p value <0.0001, odd's ratio 6.9 and 95% CI being 3.137, 15.202.

Husband being smoker also had significant association with exposure. 87/110 mothers of cases admitted that their husbands were smokers while 21/28 exposed controls had smoker husbands (p value 0.000, odd's ratio 4.83 and 95% CI being 2.338,10.116) (Table-V).

Among 110 exposed, 102(92.7%) were exposed at home and 8(7.3%) didn't have exposure at home. 49 (44.5%) were exposed to tobacco smoke at work and 61(55.5%) were not. Among 48 exposed mothers of the controls, 17(35.4%) admitted of the exposure at home while 31(64.6%) were not exposed to cigarette smoke at home. 27 (54.2%) out of 48 exposed control mothers, were exposed at work and 21 (45.8%) were not exposed to the tobacco smoke at work. (Table-VI).

Out of 300, 74 mothers had knowledge about ETS. 96 cases (64%) didn't have knowledge about passive smoking. Out of 54(36%) cases who knew what passive smoking was, only 14(25.9%) had adequate knowledge about passive smoking and its hazards (>70% on questionnaire score). The mean score of 150 cases was 2.03 and 150 controls was 3.1 with standard deviation of 3.051.80 (53.3%) mothers of the control group, had knowledge out of which 20(25%) had adequate knowledge about passive smoking and its hazards.

Out of 158 exposed to passive smoking, 66 (41.8%) had knowledge SHS and ETS exposure.

Only 11 had adequate knowledge.

Forty (36.4%) exposed mothers of case group knew about passive smoking out of which 9/40 (29%) had adequate knowledge. 26/48(54.2%) exposed mothers of the control group, had knowledge about ETS and only 2/26(7.7%) had adequate knowledge.

Respondents having knowledge about had 0.5 odds of having low birth weight babies (p value 0.003, CI 0.309-0.781). The exposed having knowledge about passive smoking had 0.48 odds of having low birth babies as compared to those not having any knowledge about it. (p value 0.037 CI 0.243-0,962). (Table-VII).

Characteristics	Cases n=150	Controls n=150	Total n=300
	Frequency (%)	Frequency (%)	Frequency (%)
Age In Years Up to 25 Above 25-30 31-35	 82 (54.7%) 36 (24.0%) 32 (21.3%)	 80 (53.3%) 39 (26%) 31 (14%)	 162 (54%) 75 (25%) 63 (21%)
Total	150 (100%)	150 (100%)	300 (100%)
Mean Age + SD	21.77+1.61	21.89+ 1.58	
Occupation Employed House wife/Unemployed	 52 (34.7%) 98 (65.3%)	 34 (22.7%) 116 (77.3%)	 86 (28.7%) 214 (71.3%)
Total	150 (100%)	150 (100%)	300 (100%)
Education Illiterate <10yrs of formal schooling >10 years of formal schooling	 43 (28.7%) 81 (54%) 26 (17.3%)	 22 (14.7%) 57 (38%) 71 (47.3%)	 65 (21.7%) 138 (46.0%) 97 (32.3%)
Total	150 (100%)	150 (100%)	300 (100%)
Low Socio Economic Status Yes No	 116 (77.3%) 34 (22.7%)	 73 (48.7%) 77 (51.3%)	 189 (63%) 111 (37%)
Total	150 (100%)	150 (100%)	300 (100%)

Table-I. Frequency distribution of socio-demographic characteristics of mothers of cases and controls.

Characteristics of Respondents' Husband		Cases n=150	Controls n=150	Total
		Frequency (%)	Frequency (%)	Frequency (%)
Education Illiterate <10yrs of formal schooling >10 years of formal schooling		 58 (38.7%) 75 (50.0%) 17 (11.3%)	 52 (34.7%) 80 (53.3%) 18 (12.0%)	 110 (36.7%) 155 (51.7%) 35 (11.6%)
Total		150 (100%)	150 (100%)	300 (100%)
Husband Smoker	Yes No	116 (77.3%) 34 (22.7%)	85 (56.7%) 65 (43.3%)	201 (67%) 99 (33%)
Total		150 (100%)	150 (100%)	300 (100%)

Table-II. Frequency distribution of characteristics of respondent's husband.

Environmental Tobacco Smoke Exposure	Cases n=150	Controls n=150	Total	P-Value* Odd's Ratio** CI
	Frequency (%)	Frequency (%)	Frequency	
Yes	110 (73.3%)	48 (32%)	158	0.000* 5.844** 3.542,9.646
No	40 (26.7%)	102 (68%)	142	
Total	150 (100%)	150 (100%)	300	

Table-III. Association of low birth weight babies with Environmental Tobacco smoke Exposure (ETS) of respondents' during pregnancy.
P value *<0.05, Odd ratio ** > 2 is taken as significant.

Characteristics	Cases n=110	Controls n=48	Total	P-Value* Odd's Ratio** CI
	Frequency (%)	Frequency (%)	Frequency	
Age In Years <25 Above 25	 58 (52.7%) 52 (47.3%)	 18 (37.5%) 30 (62.5%)	 76 82	0.07 1.859 0.928,3.721
Total	110 (100%)	48 (100%)	158	
Occupation Employed House wife/unemployed	 37 (33.6%) 73 (66.4%)	 27 (56.3%) 21 (43.7%)	 64 94	0.008* 0.392 0.196,0.789
Total	110 (100%)	48 (100%)	158	
Education Illiterate Literate	 89 (81%) 21 (19%)	 13 (27%) 35 (73%)	 102 56	0.0001* 11.4103** 5.153,25.256
Total	110 (100%)	48 (100%)	158	
Low Socio Economic Status Yes No	 71 (65%) 39 (35%)	 27 (56%) 21 (44 %)	 98 60	0.324 1.416 0.709,2.826
Total	110 (100%)	48 (100%)	158	

Table-IV. Association of socio-demographic characteristics of mothers with environmental tobacco smoke exposure during pregnancy.
P value * <0.05, Odd ratio ** > 2 is taken as significant

Characteristics of Respondents' Husband		Cases n=110	Controls n=48	Total	P-Value* Odds Ratio** CI
		Frequency (%)	Frequency (%)	Frequency	
Education Illiterate Literate		 95 (86.3%) 15 (13.7%)	 23 (48%) 25 (52%)	 118 40	<.0001* 6.9** 3.137,15.102
Total		110 (100%	48 (100%)	158	100%
Husband Smoker	Yes No	87 (79%) 23 (21%)	21 (43.8%) 27 (56.2%)	108 50	0.0000* 4.83** CI 2.338,10.116
Total		110 (100%)	48 (100%)	158	100%

Table-V. Association of ETS with characteristics of respondents' husband.
P value *<0.05, Odd ratio ** > 2 is taken as significant

Place of Exposure to ETS		Cases n=110	Controls n=48	Total Frequency	P-Value* Odd's Ratio** CI
		Frequency (%)	Frequency (%)		
Exposure at home	Yes	102 (92. 7%)	38 (79.2%)	140	0.014* 3.35** 1.233,9.134
	No	08 (7.3%)	10 (20.8%)	18	
Total		110 (100%)	48 (100%)	158	
Exposure at work		n=110	n=48	Total n=158	
	Yes	30 (27.3%)	19 (40%)	49	0.125 0.6 0.280,1.169
	No	80 (72.7%)	29 (60%)	8	
Total		110 (100%)	48 (100%)	158	

Table-VI. Association of environmental tobacco smoke exposure (ETS) with place of exposure during pregnancy. P value *<0.05, Odd's ratio ** > 2 is taken as significant

Knowledge of Mothers About ETS	Cases n=150	Controls n=150	Total	P-Value* Odd's Ratio** CI
	Frequency (%)	Frequency (%)	Frequency	
Yes	54 (36.0%)	80 (53.3%)	134	0.003* 0.5 0.309,0.781
No	96 (64.0%)	70 (46.7%)	166	
Total	150 (100%)	150 (100%)	300	
Mean Knowledge	2.03 + 3.11SD	3.11+ 3.397 SD		
	t score: -2889			0.004
	df 298	df 285.761		
Knowledge of Exposed Mothers About SHS	**Cases n=110**	**Controls n=48**	**Total**	**P-Value* Odd's Ratio** CI**
	Frequency (%)	**Frequency (%)**	**Frequency**	
Yes	40 (36.4%)	26 (54.2%)	66	0.037* 0.48 0.243,0.962
No	70 (63.6%)	22 (45.8%)	92	
Total	110 (100%)	48 (100%)	158	
Knowledge of Exposed Mothers ETS and its Hazards	**Cases n=40**	**Controls n=26**	**Total**	**P-Value* Odd's Ratio** CI**
	Frequency (%)	**Frequency (%)**	**Frequency**	
Adequate[1]	9 (29%)	2 (7.7%)	11	0.1315 3.483 0.687,17.64
Inadequate[2]	31 (71%)	24 (92.3%)	55	
Total	40 (100%)	26 (100%)	66	

Table-VII. Association of low birth weight babies with knowledge of mothers about Environmental Tobacco Smoke and Second Hand Smoke. P value * <0.05, Odd ratio ** > 2 is taken as significant.
[1]Adequate knowledge >70% on questionnaire score, [2]Inadequate knowledge < 70% on questionnaire score

DISCUSSION

Pakistan is among fifteen countries with high tobacco consumption in the world. Pregnant women are an important population for tobacco prevention efforts because its use causes serious risk to fetal and maternal health.[14,15] None of the mothers in the current study were active smoker at any time in life but 52.6% (158/300) mothers were exposed to ETS. The prevalence of exposure to tobacco smoke among cases was 73.3% (n=110) and in controls, it was 32.0% (n=48). This prevalence is higher than the quoted in Global Adult Tobacco survey where 45.7% of women are exposed to ETS at home while 37.3% are exposed both at home and workplace. Exposure to ETS among pregnant women in Pakistan is yet to be quantified. Anna Ali Nayyani and her colleagues however, quote is to be as high as 50%. Sumaira Naz, however, showed that 60.4% of non-smoker adults in Pakistan are exposed to SHS. It is notable that the studies conducted in high smoking prevalent areas

such as China, depict that as much as 54.6% pregnant women are second hand smokers.[7,15] This further highlights the magnitude of passive smoking in our country. After controlling for confounders by strict inclusion and exclusion criteria and stratification of data, it was found that odds of having low birth weight babies among mothers exposed to ETS is 5.844, CI :3.542,9.646 and p value 0.000 (p value <0.005 is taken as significant). In developed countries like U.K, ETS is attributed as a major modifiable risk factor leading to LBW with population attributable risk (PAR) being 7.1. The high odds ratio for passive smoking association in the following study :5.844 (p value 0.000, CI 3.542-9.646), showed a highly significant association between LBW babies and maternal exposure to ETS during last trimester of pregnancy. The dose response relationship and no. of hours of exposure to tobacco smoke however, were beyond the objectives of the following study and were therefore, not calculated. This odds ratio is higher to the studies conducted in India and Middle East where odds ratio were 4.1 and 3.4 respectively. Mumbare et al showed that 26.6% cases (LBW) and 9.1% controls (normal weight babies) were exposed while Abusaleh et al showed that 55.6% of controls (mothers of LBW babies) and 26.9% of controls (mothers of normal weight babies) had ETS exposure, whereas, the following study showed that 73.3% of cases and 32% of controls were exposed to it. A significant association was found between maternal ETS exposure during pregnancy and LBW with dose response relationship for the number of cigarettes smokes per day (m OR: 2.5; 95% CI: 1.5, 4.1 for >21 cigarettes /day Vs. OR:4.9;CI 2.2,10.7 for> 21 cigarettes per day). Miyake et al in a cohort study conducted in Okinawa, Japan, showed that ETS during pregnancy had significant association with LBW. These discrepancies among studies can at least be attributed to can be due to difference in socio-demographic characteristics, smoking habits and lifestyle.[12,15,16,17]

Das et al, in a cross–sectional study conducted in Hyderabad, showed similar results where prevalence of ETS was 56%. The socio-demographic characteristics' of the interviewed mothers showed that illiteracy and being housewife increased risk for being a second hand smoker (p value:0.0001, OR:11.4103,CI: 5.15,25.25 & p value:0.008 OR 0.39 CI: 0.196,0.78). Results were similar to those depicted in Mongolia, where ETS was inversely related to occupation and educational status while no significant relationship could be established with socio-economic status, irrespective of the fact that it was a large scale study. Similar results were shown by Chen and Fang in their cross sectional study conducted in Xinjiang. They found that having a partner smoker with no bans on smoking at home, poor knowledge to SHS and its hazards and age of the pregnant female were significantly associated with ETS exposure and SHS. Tobacco use in the form of smoking among adult males in Pakistan is around 22% and environmental conditions like overcrowding and poor ventilation at home make the health effects of SHS more pronounced in such settings.

In following study, 92.7% of the cases were born to households without smoking ban with odds of having home exposure being 3.35 and 86.3% of husbands were illiterate and babies born to household with illiterate husband had 6.9 odds of being LBW (p value>0.00001, CI 3.313,15.10). Exposure at home, as compared to work place, was significantly associated with LBW (OR=3.35 CI 1.233, 9.134 and OR=1.053, CI 0.280, 1.169 respectively). This was similar to results shown by Sumaira Naz where 48% of non-smokers were exposed to ETS at home. This can be result of smoking ban at the public places, making household as a main site of ETS exposure.

This shows that although exposure to SHS at work is high, but it is still not significantly associated to exposure to ETS. This point to the better work place ethics and adherence to smoking prohibition rules at work place, further highlighting the gravity of the situation in Pakistan and calling for some serious measures and awareness efforts.[7,9,15,16,17,18,19]

Although ETS during pregnancy is hazardous, the main cause for its acceptance is the lack of knowledge.[17] In the current study, 36% of interviewed women had knowledge about SHS

(cases: n=54, controls: n=80). However, only 11 (cases n=9, controls n=2) had adequate knowledge about ETS and its hazards. Our results show a worse situation in that in survey conducted by Bahawalpur University involving city's population from different strata. 611 respondents were interviewed and it was found that only 35.2% had heard the term passive smoking or SHS' and 25.4% knew that it was as dangerous as active smoking. It can be argued that since the population of the survey included both adult male and females, smokers and non-smokers, therefore, the answers can be biased.[20]

A cross- sectional study conducted in urban slums of Karachi by Bhanji et al showed that 77% of women knew about ETS and its hazards. However, only 7% knew about adverse fetal effects such as low birth weight. In the following study, only 8.2% of the total had adequate knowledge about passive smoking and its hazards. Similar results were found in the study conducted by Das et al where mothers had some knowledge about the health impacts of active smoking, but they had almost no understanding about SHS, health consequences in general or on pregnant women and fetus. Only 10 out of 350 women define some conditions related to pregnancy outcomes and SHS. The mean score calculated for both cases and controls was 2.04. The mean score was less in controls who had better understanding of SHS and its hazards. This was shown by the significant p value when difference of mean score of cases and controls about knowledge about passive smoking and its hazards, was made (t score of 2889 and p value 0.004 (significant as $p< 0.005$). Vu et al showed that mean knowledge score of pregnant women attending the tertiary care hospital in Vietnam was 4.19 +2.12 (with 3.99; 4.39 at 95% CI) Similar results were shown by Akram Abu Salah et al.[19,21,22]

Although the effects of ETS on LBW babies is well document in the developed countries, it is still unaddressed in the countries like Pakistan. The following study tries to cover such gaps and quantifies the effect of ETS exposure on birth weight of the new-borns. In low income countries like, Pakistan where the government spends a hefty amount on horizontal and vertical programs on maternal, new born and child health, operating at all tiers of the health system, the role of environmental physical agents such as tobacco smoke is yet not realized and is therefore left unturned. The current study aims to focus the SHS on poor pregnancy outcomes specifically, the LBW. It attempted to show association between low birth weight and passive smoking exposure during last trimester of pregnancy. The high strength of association opens a forum for sophisticated quantitative studies with larger sample size.

Although biochemical methods are superior to self-reporting, a meta-analysis conducted by G. Salmasi et al, illustrated a similar decreases in birth weight with maternal self-report of passive smoking exposure while comparing with biochemical analyses, further signifying the importance of self-reporting even the in the availability of sophisticated bio-chemical analysis.[23]

LIMITATIONS

The study had several constraints as well. This study used self-reported measures to ascertain, which could result in an incorrect estimation of ETS exposure either due to inability to recall the maternal exposure or an unwillingness to declare exposure. The researcher tried to minimize this by selecting one consecutive control after each case recruited on the same day and same place. To minimize inter-observer bias, one person collected all the data using a pre-designed questionnaire in same tone, duration and time.

The inability to measure biomarkers due to resource constraints was due to resource constraints. This study only highlighted ETS exposure; its modifiers such as number of smokers, ventilation and overcrowding, were not considered. As the study setting was urban, the dilemma of rural women, who have higher incidence of low birth weight babies (33%)[22], is still unclear.

Only knowledge of mothers about ETS was addressed in this study and not much couldn't

be said about attitudes and practices of the interviewees.

CONCLUSION

Pregnant mother acknowledging their exposure to ETS during pregnancy had 5.84 odds of having LBW babies than unexposed, endorsing the association between the two. Illiteracy, unemployed, having a smoker husband with no or inadequate knowledge of SHS and its hazards adds to their ignorance.

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