ABSTRACT

Background: Maternal smoking is known to pose risks to both baby and mother affecting aspects from fertility and pregnancy outcome to fetal and child development.

Objective: To study the prevalence of maternal smoking globally and its adverse pregnancy outcomes.

Materials and methods: Health sciences electronic databases PubMed and Google Scholar were searched for studies published between 2006 to March 2020. Keywords used for the search were (“tobacco”), (“maternal smoking”), (“effects of maternal smoking”) and (“globally”). A total of 29 articles were included in the review based on the eligibility criteria. Statistical software SPSS-V.23 was used for the statistical application.

Result: A total of 29 studies met the inclusion criteria with a total of 11,34,769 women, age ranged from 12-45 years and above. Maternal smoking was reported by 22.26% women. Those women who reside in rural areas, illiterate, homemaker, from low economic status and whose husband smoke have higher maternal smoking prevalence and its adverse pregnancy outcomes were reported as 23.27% low maternal weight, 62.46% anaemic mother, 8.76% low birth weight, 12.86% preterm birth, 79% low birth length and 15.77% obesity among children.

Conclusion: Maternal tobacco use in any form increases risk of ill effects on mother and child health. Tobacco cessation during pregnancy is necessary to reduce morbidity and mortality related to tobacco use.

Key words- Maternal smoking, cigarette, smokeless tobacco, prevalence, effects of maternal smoking, Globally

INTRODUCTION

Exposure to tobacco smoke is harmful as it contains thousands of compounds that have toxic effects (1). Tobacco consumption is one of the major preventable causes of mortality and morbidity around the world, affecting developed as well as developing countries (2). Tobacco consumption is killing more than 8 million people every year around the world. Direct tobacco use kills more than 7 million of deaths whereas second hand smoking kills 1.2 million people every year (3). Health professionals have long before considered maternal tobacco consumption harmful to reproduction, affecting aspects
from fertility and pregnancy outcome to fetal and child development (4). Smoking during pregnancy is a public health problem because of many adverse effects on mother and child. These include abortions, low maternal weight, Anemia (5), (6), (7). It is a known risk factor for many pediatric conditions including preterm delivery, low birth weight, still birth and SUID (8), (9), (10). Majority of studies have shown that illiteracy, unemployment, husband smoke, early pregnancy, addiction and lack of awareness regarding the ill effects are the causes of maternal smoking (11) (12). There is also one false belief that smokeless tobacco consumption is safe and less harmful compared to cigarette smoking which lead to increased consumption of smokeless tobacco use (13). Mortality and morbidity due to maternal smoking is preventable by educating and advocating mothers. Tobacco Cessation, prevention of second hand smoke exposure and prevention of going back to smoking after quitting are important intervention strategies that should be implemented in every PHC and antenatal care clinics (14). This will surely decrease maternal smoking prevalence Globally. There is dearth of studies regarding this topic, so this study is being conducted to provide awareness regarding adverse pregnancy outcomes of maternal smoking.

MATERIALS AND METHODOLOGY

A comprehensive search of quantitative literature was undertaken independently using PubMed and Google scholars for appropriate English publications. Our systematic review was done according to PRISMA guidelines (15). Inclusion criteria consists of population-based studies (Case-control, cohort, Observational studies, Randomized control studies, conducted in diverse settings like hospitals, PHC, communities published from 2006 till 2020 in English language. Exclusion criteria consists of Case reports, case studies, Cross sectional studies and reviews. Articles published in languages other than English, studies reporting maternal smoking prevalence only and not including outcome were also excluded. (Figure 01) shows the selection process of the articles retrieved. Studies that met the inclusion criteria was finally included for the review (16-44).

Figure 01: Summary of literature search and review process
RESULTS

Our literature review yielded 29 studies eligible for inclusion in the meta-analysis of maternal smoking and its adverse pregnancy outcome (Table 01). These studies included a population of total 11,34,769 women. Data was collected from India and other developed and developing countries (Bangladesh, Japan, USA, South Africa, Brazil, and European countries including Norway, Sweden, Australia, Poland, Belgium, France and the United Kingdom. A majority of studies are cohort (22), 5 case control, 1 observational and 1 randomized control study.

Studies from India: Maternal smoking prevalence was reported as 50% (18),(20) in Maharashtra and Delhi. Majority of studies were conducted in Maharashtra (16),(17),(19),(20),(21). The most recent study conducted in 2018 (21) reported 16% maternal smoking prevalence whereas study conducted in 2010 (17) reported 30.92%. This revealed that there is a decrease in maternal smoking year by year. In India smokeless tobacco consumption during pregnancy is more prevalent than cigarette smoking. Out of 6 studies no study reported maternal cigarette smoking. Maternal smoking adverse effects were reported as Anemic mother (19),(20),(21), Abortion (17),(18), Miscarriage (18), Low maternal weight (17), Pregnancy Induced Hypertension (17) and Pre-eclampsia (18). Low birth weight <2500g (17),(18),(20), Still birth (16),(17), Low birth length <50cm (20) and Preterm birth (17).

Study from Bangladesh: Maternal smoking prevalence was reported as 61.75% which is more than India. Here also smokeless tobacco consumption is more prevalent, this may reflect cultural differences in acceptability of cigarette smoking, perhaps contributing to under-reporting. Adverse pregnancy outcome was Still birth (22).

Studies from Japan: Maternal smoking prevalence ranged from 3.85% to 41.48%. Its effects were reported as low maternal weight (23), low birth weight (25),(27), Preterm birth (25), Neonatal asphyxia (24), ADHD (26). There was one unique finding that revealed 4.9% of children exposed to smoke during prenatal period were having missing teeth or decayed teeth (25).

Studies from USA: Maternal smoking prevalence in 2015 was reported as 50% (28) and in 2018 as 5.24% (30) indicating a decrease in prevalence of maternal smoking. Its effects were reported as low maternal weight (30), low birth weight (28), low total body iron content (28), preterm birth (29),(30), It was also revealed that exposure to smoke during pregnancy creates effects on fetus organs development and leads to respiratory problems and coronary heart disease (30).

Studies from South Africa: Maternal smoking prevalence in 2015 was 42.37 % (31) and in 2017 it reduced to 31.43% (33). Ill effects were reported as Anembic mothers (35), low birth weight (32),(33), preterm birth (32),(33), respiratory distress (31),(32), proteinuria (32) and neonatal asphyxia (32).

Studies from Brazil: Maternal smoking prevalence was reported as 14.42% (34) and 31.5% (35). Harmful effects were Anaemic mothers (35), low birth weight (34) and pre-eclampsia (35). Here it was reported that prenatal smoking can also cause long term effects on children such as Obesity (34).

Studies from European countries: Maternal smoking prevalence ranged from 7.56% (37) to 51% (43). Studies from Sweden and Norway reported its effects as miscarriage (44). Here also like Brazil, it was revealed that maternal smoking leads to long term effects on children such as ADHD (37), Obesity (43) and short stature (43).

Maternal smoking prevalence in Australia (41) was reported as 51.75%. Antenatal depression, low birth weight, preterm birth were adverse pregnancy outcomes. Here also long term effects on exposed children was revealed. There were 5.5% children who faced trouble in sleeping, 8.3% reported sleeplessness and 20.9% reported night walking during sleep.

Maternal smoking prevalence was noted as 50% in Poland (42). Here the study
reported low birth weight <2500g, low birth length <50cm, small head circumference and low iron content among exposed infants.

Study from Belgium (38) reported 33.24% maternal smoking prevalence and its effects were low birth weight and low birth length.

Based on a single study from France (39) reported 94.6% maternal smoking prevalence which is the highest prevalence among all other countries taken in this review. Its effect was reported as low birth weight.

A study in the United Kingdom (36) reported very low maternal smoking prevalence as 4.7%. The effect on exposed infants was reported as preterm birth.

Table 01: Detailed characteristics of studies on maternal smoking and its adverse pregnancy outcomes included in the systematic review

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Author/Year</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Maternal Smoking prevalence</th>
<th>Population Characteristics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Prakash chandra gupta et al, 2006 (16)</td>
<td>Cohort study</td>
<td>1,217</td>
<td>16.92%</td>
<td>State:Maharashtra, India</td>
<td>Stillbirth 8.9%</td>
</tr>
<tr>
<td>2.</td>
<td>Asha Pratinidhi et al, 2010 (17)</td>
<td>Cohort study</td>
<td>705</td>
<td>218 (30.92%)</td>
<td>State:Maharashtra, India</td>
<td>Low maternal weight (30.7%), Abortion 9.6%, Operative Delivery (10.6%), Pregnancy Induced Hypertension 2.3%, Preterm birth 9.6%, Stillbirth 2.7%, LBW 19.3%</td>
</tr>
<tr>
<td>3.</td>
<td>Ayalur Gopalakrishnan Radhika et al, 2014 (18)</td>
<td>Cohort study</td>
<td>184</td>
<td>92 (50%)</td>
<td>State: Delhi, India</td>
<td>Miscarriage 2.25%, Abortion 2.12%, Operative deliveries 18%, Pre-eclampsia 2%, LBW 37.49%</td>
</tr>
<tr>
<td>4.</td>
<td>Hemlata shedg et, ol, 2017 (19)</td>
<td>Case control study</td>
<td>591</td>
<td>191 (32.31%)</td>
<td>State: Maharashtra, India</td>
<td>Anemia (86.18%)</td>
</tr>
<tr>
<td>5.</td>
<td>Praveen Ganganahalli et al, 2017 (20)</td>
<td>Cohort study</td>
<td>210</td>
<td>105 (50%)</td>
<td>State: Maharashtra, India</td>
<td>Anemia (62%), Low Birth Weight (75.2%), Low Birth Length (79%)</td>
</tr>
<tr>
<td>6.</td>
<td>Ritesh Mistry et al, 2018 (21)</td>
<td>Observational study</td>
<td>100</td>
<td>16 (16%)</td>
<td>State: Maharashtra, India</td>
<td>Anemia (88%)</td>
</tr>
</tbody>
</table>

BANGLADESH

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Author/Year</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Maternal Smoking prevalence</th>
<th>Population Characteristics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>Mohammad Shakhatsho et al 2018 (22)</td>
<td>Case control study</td>
<td>1,012</td>
<td>625 (61.75%)</td>
<td>Country: Bangladesh</td>
<td>Still Birth</td>
</tr>
<tr>
<td>8.</td>
<td>Emi Akahoshi et al 2015 (23)</td>
<td>Cohort study</td>
<td>621</td>
<td>45 (7.24%)</td>
<td>Country: Japan</td>
<td>Low Maternal Weight 16.7%</td>
</tr>
<tr>
<td>10.</td>
<td>Junka Nakagawa et al, 2019 (25)</td>
<td>Cohort study</td>
<td>772</td>
<td>46(6%)</td>
<td>Country: Japan</td>
<td>Operative deliveries 26.5%, LBW 8.3%, Preterm birth 8.3%, Missing Teeth 4.9%</td>
</tr>
<tr>
<td>11.</td>
<td>Machiko Minatoya et al 2019 (26)</td>
<td>Cohort study</td>
<td>3,216</td>
<td>1334 (41.48%)</td>
<td>Country: Japan</td>
<td>ADHD</td>
</tr>
<tr>
<td>12.</td>
<td>Tadao Ooka et al 2019 (27)</td>
<td>Cohort study</td>
<td>20,276</td>
<td>782 (3.85%)</td>
<td>Country: Japan</td>
<td>Low Birth Weight 21%</td>
</tr>
</tbody>
</table>

INDIA

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Author/Year</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Maternal Smoking prevalence</th>
<th>Population Characteristics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Prakash chandra gupta et al, 2006 (16)</td>
<td>Cohort study</td>
<td>1,217</td>
<td>16.92%</td>
<td>State:Maharashtra, India</td>
<td>Stillbirth 8.9%</td>
</tr>
<tr>
<td>2.</td>
<td>Asha Pratinidhi et al, 2010 (17)</td>
<td>Cohort study</td>
<td>705</td>
<td>218 (30.92%)</td>
<td>State:Maharashtra, India</td>
<td>Low maternal weight (30.7%), Abortion 9.6%, Operative Delivery (10.6%), Pregnancy Induced Hypertension 2.3%, Preterm birth 9.6%, Stillbirth 2.7%, LBW 19.3%</td>
</tr>
<tr>
<td>3.</td>
<td>Ayalur Gopalakrishnan Radhika et al, 2014 (18)</td>
<td>Cohort study</td>
<td>184</td>
<td>92 (50%)</td>
<td>State: Delhi, India</td>
<td>Miscarriage 2.25%, Abortion 2.12%, Operative deliveries 18%, Pre-eclampsia 2%, LBW 37.49%</td>
</tr>
<tr>
<td>4.</td>
<td>Hemlata shedg et, ol, 2017 (19)</td>
<td>Case control study</td>
<td>591</td>
<td>191 (32.31%)</td>
<td>State: Maharashtra, India</td>
<td>Anemia (86.18%)</td>
</tr>
<tr>
<td>5.</td>
<td>Praveen Ganganahalli et al, 2017 (20)</td>
<td>Cohort study</td>
<td>210</td>
<td>105 (50%)</td>
<td>State: Maharashtra, India</td>
<td>Anemia (62%), Low Birth Weight (75.2%), Low Birth Length (79%)</td>
</tr>
<tr>
<td>6.</td>
<td>Ritesh Mistry et al, 2018 (21)</td>
<td>Observational study</td>
<td>100</td>
<td>16 (16%)</td>
<td>State: Maharashtra, India</td>
<td>Anemia (88%)</td>
</tr>
</tbody>
</table>

JAPAN

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Author/Year</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Maternal Smoking prevalence</th>
<th>Population Characteristics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Emi Akahoshi et al 2015 (23)</td>
<td>Cohort study</td>
<td>621</td>
<td>45 (7.24%)</td>
<td>Country: Japan</td>
<td>Low Maternal Weight 16.7%</td>
</tr>
<tr>
<td>10.</td>
<td>Junka Nakagawa et al, 2019 (25)</td>
<td>Cohort study</td>
<td>772</td>
<td>46(6%)</td>
<td>Country: Japan</td>
<td>Operative deliveries 26.5%, LBW 8.3%, Preterm birth 8.3%, Missing Teeth 4.9%</td>
</tr>
<tr>
<td>11.</td>
<td>Machiko Minatoya et al 2019 (26)</td>
<td>Cohort study</td>
<td>3,216</td>
<td>1334 (41.48%)</td>
<td>Country: Japan</td>
<td>ADHD</td>
</tr>
<tr>
<td>12.</td>
<td>Tadao Ooka et al 2019 (27)</td>
<td>Cohort study</td>
<td>20,276</td>
<td>782 (3.85%)</td>
<td>Country: Japan</td>
<td>Low Birth Weight 21%</td>
</tr>
</tbody>
</table>
### Table 1: Continued…

<table>
<thead>
<tr>
<th></th>
<th>Study Details</th>
<th>Country</th>
<th>Sample Size</th>
<th>Age Range</th>
<th>Education</th>
<th>Major Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>Irina B. Pateva et al, 2015</td>
<td>USA</td>
<td>Cohort</td>
<td>144</td>
<td>72 (50%)</td>
<td>Country: USA Education: Literate (till 12.5 yrs) population LBW Low Iron content in infants</td>
</tr>
<tr>
<td>14.</td>
<td>Elizabeth Moore et al, 2016</td>
<td>SOUTH AFRICA</td>
<td>Retrospective cohort</td>
<td>9,13,757</td>
<td>216491 (23.69%)</td>
<td>Country: USA Age: &lt;20-35 Education: 15.3% illiterate Preterm birth 13.62%</td>
</tr>
<tr>
<td>15.</td>
<td>Leili Behroz et al, 2018</td>
<td>USA</td>
<td>Case-control design</td>
<td>1,353</td>
<td>71 (5.24%)</td>
<td>Country: USA Education: 70% Literate Low maternal weight 6% Operative deliveries 16% Preterm birth 8% Bronchiolitis Coronary Heart Disease 3%</td>
</tr>
</tbody>
</table>

**USA**

<table>
<thead>
<tr>
<th></th>
<th>Study Details</th>
<th>Country</th>
<th>Sample Size</th>
<th>Age Range</th>
<th>Education</th>
<th>Major Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>DIANE GRAY et al, 2015</td>
<td>USA</td>
<td>Cohort</td>
<td>177</td>
<td>75 (42.37%)</td>
<td>Country: South Africa Respiratory problem</td>
</tr>
<tr>
<td>17.</td>
<td>A. Vanker et al, 2016</td>
<td>SOUTH AFRICA</td>
<td>Cohort</td>
<td>789</td>
<td>250 (31.68%)</td>
<td>Country: South Africa Education: 9% Illiterate Employment: 74% Homemaker Antenatal Depression 21% LBW 15% Preterm birth 16% Respiratory Distress 5% Proteinuria 1.7% Neonatal Asphyxia 1.1%</td>
</tr>
<tr>
<td>18.</td>
<td>S Budree et al, 2017</td>
<td>SOUTH AFRICA</td>
<td>Cohort</td>
<td>789</td>
<td>248 (31.43%)</td>
<td>Country: South Africa Education: 9% Illiterate Employment: Homemaker 74% Antenatal Depression 26% LBW 15% Preterm birth 15%</td>
</tr>
</tbody>
</table>

**SOUTH AFRICA**

<table>
<thead>
<tr>
<th></th>
<th>Study Details</th>
<th>Country</th>
<th>Sample Size</th>
<th>Age Range</th>
<th>Education</th>
<th>Major Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.</td>
<td>Ana Paula Muraro et al, 2016</td>
<td>BRAZIL</td>
<td>Cohort</td>
<td>2,405</td>
<td>347 (14.42%)</td>
<td>Country: Brazil LBW 6.4% Obesity 0.45%</td>
</tr>
<tr>
<td>20.</td>
<td>Mariana Lopes de Brito et al, 2017</td>
<td>BRAZIL</td>
<td>Case control study</td>
<td>273</td>
<td>86 (31.5%)</td>
<td>Country: Brazil Education: 51.2% Literate Anemia 2.6% Pre-eclampsia 17.5%</td>
</tr>
</tbody>
</table>

**BRAZIL**

<table>
<thead>
<tr>
<th></th>
<th>Study Details</th>
<th>Country</th>
<th>Sample Size</th>
<th>Age Range</th>
<th>Education</th>
<th>Major Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>Uttara Partap et al, 2016</td>
<td>European countries</td>
<td>Cohort</td>
<td>3,892</td>
<td>183 (4.7%)</td>
<td>Country: United Kingdom Preterm birth 9.2%</td>
</tr>
<tr>
<td>22.</td>
<td>Kristin Gustavson et al, 2017</td>
<td>Norway</td>
<td>Cohort</td>
<td>1,04,846</td>
<td>9390 (7.56%)</td>
<td>Country: Norway Age: &lt;24-35 Education: 27% Literate ADHD 4.6%</td>
</tr>
<tr>
<td>23.</td>
<td>Bram G. Janssen et al, 2017</td>
<td>België</td>
<td>Cohort</td>
<td>382</td>
<td>127 (33.24%)</td>
<td>Country: België Age: 18-42 Education: 30.6% illiterate population LBW Low Birth Length</td>
</tr>
<tr>
<td>24.</td>
<td>Ivan Berlin et al, 2017</td>
<td>European countries</td>
<td>Randomized control</td>
<td>371</td>
<td>351 (94.6%)</td>
<td>Country: France Age: 18+ LBW</td>
</tr>
<tr>
<td>25.</td>
<td>Yasmine Arbad et al, 2018</td>
<td>United Kingdom, Denmark</td>
<td>Case control study</td>
<td>55</td>
<td>22 (40%)</td>
<td>Country: Denmark Low Maternal Weight LBW</td>
</tr>
<tr>
<td>26.</td>
<td>Frances O’Callaghan et al, 2019</td>
<td>Australia</td>
<td>Cohort</td>
<td>7,223</td>
<td>3738 (51.75%)</td>
<td>Country: Australia Age: 15-35 Education: 18.2% illiterate Antenatal Depression 11.6% LBW 4.3% Preterm birth 4.1% Sleeplessness 8.3% Trouble Sleeping 5.5% Night Walking 20.9%</td>
</tr>
<tr>
<td>27.</td>
<td>Magdalena Chelchowska et al, 2019</td>
<td>Poland</td>
<td>Cohort</td>
<td>80</td>
<td>40 (50%)</td>
<td>Country: Poland LBW Low Birth Length Small Head Circumference Low Iron content in infant 15.5%</td>
</tr>
<tr>
<td>28.</td>
<td>Sarah E. Maessen et al, 2019</td>
<td>Sweden</td>
<td>Cohort</td>
<td>22,421</td>
<td>9311 (41.52%)</td>
<td>Country: Sweden Age: 18+ Obesity 15.2% Short Stature 55%</td>
</tr>
<tr>
<td>29.</td>
<td>Ina Kreyberg et al, 2019</td>
<td>Denmark</td>
<td>Cohort</td>
<td>2,313</td>
<td>252 (10.89%)</td>
<td>Country: Norway &amp; Sweden Education: 32.4% Literate Miscarriage 4.9%</td>
</tr>
</tbody>
</table>

The Socio demographic characteristics of the women are shown in Table 02. Sample size is 11,34,769 women, age ranging from 12 years to 45 years and above. Maternal smoking prevalence was 22.26% including 0.57% smokeless tobacco users and 99.42% cigarette smokers. There were 76.59% women who reported no
smoking during pregnancy. There were 22.92% literate population and 30.69% illiterate population who consume tobacco. Employment status of mothers who smoke during pregnancy was categorized as homemaker (79.86%) and employed women (5.91%). Economic status was categorized as Low (32.55%) and High (12.90%). There were 46.40% women whose husband smokes and 60.83% women were exposed to second-hand smoking.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sample size</td>
<td>11,34,769</td>
<td></td>
</tr>
<tr>
<td>No. Of smokers</td>
<td>2,52,671</td>
<td>22.26</td>
</tr>
<tr>
<td>No. Of non-smokers</td>
<td>8,69,210</td>
<td>76.59</td>
</tr>
<tr>
<td>Total smokeless tobacco users</td>
<td>1,453</td>
<td>0.57</td>
</tr>
<tr>
<td>Total cigarette smokers</td>
<td>2,51,218</td>
<td>99.42</td>
</tr>
<tr>
<td>Age range</td>
<td>12-45 years</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Total (N) Smokers (n) %</td>
<td></td>
</tr>
<tr>
<td>Literate</td>
<td>19,128</td>
<td>4,385</td>
</tr>
<tr>
<td>Illiterate</td>
<td>1,51,410</td>
<td>46,468</td>
</tr>
<tr>
<td>Employment</td>
<td>Homemaker</td>
<td>2,448</td>
</tr>
<tr>
<td>Employed</td>
<td>541</td>
<td>32</td>
</tr>
<tr>
<td>Economic status</td>
<td>Low</td>
<td>6,854</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>4,147</td>
</tr>
<tr>
<td>Husband smoke</td>
<td>4,754</td>
<td>2,206</td>
</tr>
<tr>
<td>Exposure to second-hand smoking</td>
<td>45,444</td>
<td>27,644</td>
</tr>
</tbody>
</table>

**Figure 02: Maternal smoking effects on Mother and offspring**

- Neonatal asphyxia: 1.30%
- Congenital heart disease: 3%
- ADHD: 4.60%
- Teeth problems: 4.90%
- Troubles sleeping: 5.50%
- Abortion: 8.10%
- Low birth weight: 8.76%
- Fetal distress: 14.20%
- Pre-eclampsia: 14.28%
- Obesity: 15.51%
- Low iron content: 21.10%
- Low maternal weight: 22.64%
- Anemia: 55%
- Low birth length: 70.24%

International Journal of Health Sciences and Research (www.ijhsr.org)  Vol.11; Issue: 4; April 2021
Maternal smoking effects on mother’s health (Figure 02): This review reported various health issues occurred due to consumption of tobacco during pregnancy. The most common health complications were Anemia (62.46%), Low maternal weight (23.27%), Antenatal depression (22.64%), and, followed by Pre-eclampsia (14.28%), Maternal health complications (14.21%), Fetal distress (14.20%), Abortion (8.10%) and miscarriage (4.21%). Normal vaginal deliveries (70.24%) were more common than operative deliveries (15.51%).

Effects on infants (Figure 02): The most common adverse effects were reported as Low birth weight (8.76%), Preterm birth (12.86%), Low iron content (21.1%), and Low birth length (79%), followed by Sleeplessness (8.3%), Still birth (5.6%), Respiratory distress (5.0%), Neonatal death (4.7%), Congenital heart disease (3%) and Neonatal asphyxia (1.3%).

Effects on children and adolescents (Figure 02): There were several adverse effects on children and adolescents including, Proteinuria (1.64%), ADHD (4.6%), Teeth problems (4.9%), Trouble sleeping (5.5%), Obesity (15.77%), Night walking and talking (20.9%) and Short stature in 55% children.

DISCUSSION

This review reported the prevalence of maternal smoking ranged from 3.85% to 61.75% (Table 01). In this review we found that mothers who were illiterate, housewives and from low Socioeconomic status were more likely to continue smoking during pregnancy (Table 02). This finding was supported by M.Mohsin (2011) and Erin Passmore (2015) in their respective studies reporting women from low Socioeconomic status continued smoking during pregnancy (45) (46). S.Agazba (2020) reported that maternal smoking prevalence is high in less educated women (47). J.Smedberg (2015) and T.Strini (2005) in their respective studies reported that women with low education, low socioeconomic status and housewife were more likely to smoke during pregnancy (48)(49).

Our review revealed that maternal smoking leads to adverse pregnancy outcomes to mother as well as child. Some most common effects on mother’s health are Anemia (62.46%) and low maternal weight (23.27%). This finding was supported by majority of studies. S.Subramoney (2007) reported 26% Anemia (20). Another study by Prakash (2004) reported 41.1% Anaemia and 31.7% low maternal weight (51). Ting jung Ku (2014) in his study revealed 16.6% low maternal weight <10kg (52). The prevalence varied in different studies due to different sample size.

Our review revealed preterm birth (12.9%) and low birth weight (8.8%) are most common maternal smoking outcomes. S.Soneji (2019) in his study reported 9.8% preterm births occurred due to maternal smoking hence supported our findings (53). Wei zhang (2016) reported 16.3% low birth weight (54). Another study conducted by Shih hui huang (2017) reported 4.7% low birth weight and 28.1% preterm birth (55).

Our review also revealed long term effects on children and adolescents. Most common outcomes were short stature (55%), sleep problems(5.50%) and obesity (15.77%). This finding of our review was supported by O.Robinson (2016) in his study where 15.4% children were overweight at the age of 4 years (56). Another study by Rudiger von Kries (2008) reported 19% exposed children were found to be obese (57). Another study by S.Rayfield (2016) reported the prevalence of obesity from 2.6-17% (58). Association between maternal smoking and sleep problems among children were reported by Kristen C.Stone (2010). Higher levels of prenatal nicotine exposure predicted more sleep problems, specifically difficulty falling and staying asleep, from 1 month to 12 years (59). E.S.Blanchard (2008) stated that neonates born to smoker mothers had disrupted sleep structure and continuity and they slept less over all (60). Association between maternal...
smoking and short stature was reported by Toshihiro (2011), where it was concluded that those children whose mother smoked during pregnancy were shorter and were obese [61]. Aimin chain (2006) also reported in the study that children of smoker mothers were consistently shorter and heavier than children of mothers who did not smoke during pregnancy [62].

In this review, several findings are important. First, our results are an important reminder that maternal smoking is still prevalent in women globally, despite continuous efforts from health care professionals. Currently, a huge number of infants are exposed to tobacco during fetal life each year, resulting in morbidity and mortality. Therefore continued attention from the respective government authorities is needed. Second, detection of maternal characteristics that act as barriers to tobacco cessation during pregnancy, focus in increasing the education level among women is an important societal effort needed to achieve healthier pregnancies that can be beneficial for mother and child. Awareness regarding harmful effects is important as from this study we came to know that a majority of women are unaware of harmful effects of tobacco consumption on fetus growth and development.

CONCLUSION

The systematic review concludes that Tobacco consumption during pregnancy in any form increases risk of adverse effects on mother and child health. Health care professionals and community efforts is required to educate and aware mothers regarding harmful effects. Tobacco cessation during pregnancy is necessary to reduce morbidity and mortality related to tobacco use.

Strength:

To our knowledge it is one of the first reviews that provide an insight into maternal smoking adverse pregnancy outcomes on mother’s health as well as on child growth and development on a global level. It will serve as a guiding knowledge for health care professionals to execute tobacco cessation during pregnancy and bring awareness in women regarding its ill effects, thus resulting in the decline in mortality and morbidity due to smoking during pregnancy.

Limitations:

Maternal smoking is known to be under-reported by mothers, thus the magnitude of the association between maternal smoking and effects is likely to be underestimated. The data from which values are predicted are from different geographical area and heterogeneity of diversified population data collected and pooled from various studies. Variations such as age range, sampling techniques, were also not uniform. Merging such data may lead to high heterogeneity which is a potential source of bias.

Conflict of Interest

There is no conflict of Interest.

Acknowledgement: None

Source of Funding: None

REFERENCES

3. https://www.who.int/news-room/fact-sheets/detail/tobacco [Last accessed on 5/05/2020]
6. Agarwal, Gagan, Ahmad, Sartaj, Maternal Risk Factors Associated with Low Birth Weight Neonates in a Tertiary Care Hospital, Northern India, 2012/01/01, JOUR Journal of Community Medicine & Health Education, 10.4172/2161-0711.1000177, vol 02
23. Emi Akahoshi, Kazuhiko Arima, Kiyonori Miura, Takayuki Nishimura, Yasuyo Abe, Naoko Yamamo et al, Association of maternal pre-pregnancy weight, weight gain during pregnancy, and smoking with small-for-gestational-age infants in Japan (2016),...


33. S Budree (bdrshr001@myuct.ac.za), DJ Stein, K Brittain, E Goddard, N Koen, W Barnett, Maternal and infant factors had a significant impact on birthweight and longitudinal growth in a South African birth cohort, 2017, journal- Acta Pedia trica ISSN 0803-5253


40. Vella, Yasmine, Association Between Infant Birth Weight and Maternal Health: Effects by Maternal Smoking, 2018/12/01


42. Chelchowska M, Maciejewski TM, Mazur J, et al. Active Tobacco Smoke Exposure in


53. Samir Soneji, Association of maternal cigarette smoking and smoking cessation with preterm birth 2019, journal of Obstetrics and Gynecology, 2019,2514


57. Rüdiger von Kries, Gabriele Bolte, Ladan Baghi, André Michael Toschke, for the GME Study Group, Parental smoking and childhood obesity—is maternal smoking in pregnancy the critical exposure?, International Journal of Epidemiology, Volume 37, Issue 1, February 2008, Pages 210–216,

58. Rayfield S, Plugge E Systematic review and meta-analysis of the association between maternal smoking in pregnancy and

International Journal of Health Sciences and Research (www.ijhsr.org) 180
Vol.11; Issue: 4; April 2021
childhood overweight and obesity J Epidemiol Community Health 2017;71:162-173
61. Ino T1, Shibuya T, Saito K, Ohtani T, Effects of maternal smoking during pregnancy on body composition in offspring, 2011, journal of Pediatrics International © 2011 Japan Pediatric Society,


******