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A Review of The Effects of Minimal Alcohol Use During Pregnancy

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ABSTRACT

Background: The issue of whether it is safe to drink minimal to moderate amounts of alcohol during pregnancy has remained extremely controversial. Fetal alcohol exposure is a big concern for expectant mothers and the effect it may have on the fetus. Many expectant mothers have come forward saying it is fine to drink a glass of wine a day during pregnancy because they have not seen any adverse effects. **Purpose:** The purpose of this review was to determine the effects of minimal alcohol use during pregnancy. **Method:** The method used to collect data was a literature search of the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed from 2017-2021. The research question was, in expectant mothers, how does light to moderate alcohol consumption compared to complete abstinence influence inf ant complications throughout and after pregnancy? **Findings:** Identified themes of this study were low birth weight, preterm birth, miscarriage, and neuropsychological outcomes. **Conclusion:** Further research and a standard definition of light to moderate alcohol intake are needed to understand the full relationship between the level of alcohol consumption in pregnancy and infant outcomes. Women should be advised to abstain from alcohol in pregnancy because of the lack of research and mixed results regarding light to moderate alcohol consumption.

INTRODUCTION

The use of alcohol during pregnancy and labor has been a controversial topic for many years with varying opinions. The Center for Disease Control and Prevention (CDC) [1] addressed this issue by noting, there is no known safe amount of alcohol use during pregnancy or while trying to get pregnant. Research indicates that large amounts of alcohol used throughout pregnancy can have negative effects on the fetus; however, the driving force behind this review was to determine the effects of minimal alcohol use during pregnancy. Although there is no confirmed "safe" threshold, some women continue to drink alcohol during pregnancy.

There are questions of whether there is a correlation between alcohol use in pregnancy and miscarriage, preterm birth, birth weight, and the impact on child neuropsychological outcomes. As shown in Figure 1, drinking alcohol during pregnancy can cause miscarriage, stillbirth, and intellectual, physical, and behavioral disabilities, which are known as fetal alcohol spectrum disorders [1]. However, the question still stands, is it proven that any amount of alcohol is unsafe in pregnancy? The purpose of this review was to determine the effects of minimal alcohol use during pregnancy. The United States Drug Administration defines moderate drinking for women to be one drink per day [2]. Healthcare professionals are often hesitant to explore with patients their relationship with alcohol and the role that it has in their presenting complaint, despite being ideally placed to optimize on a 'teachable moment' and initiate treatment, where necessary [3]. The question addressed in this review was, in expectant mothers, how does light to moderate alcohol consumption compared to complete abstinence influence infant complications throughout and after pregnancy?

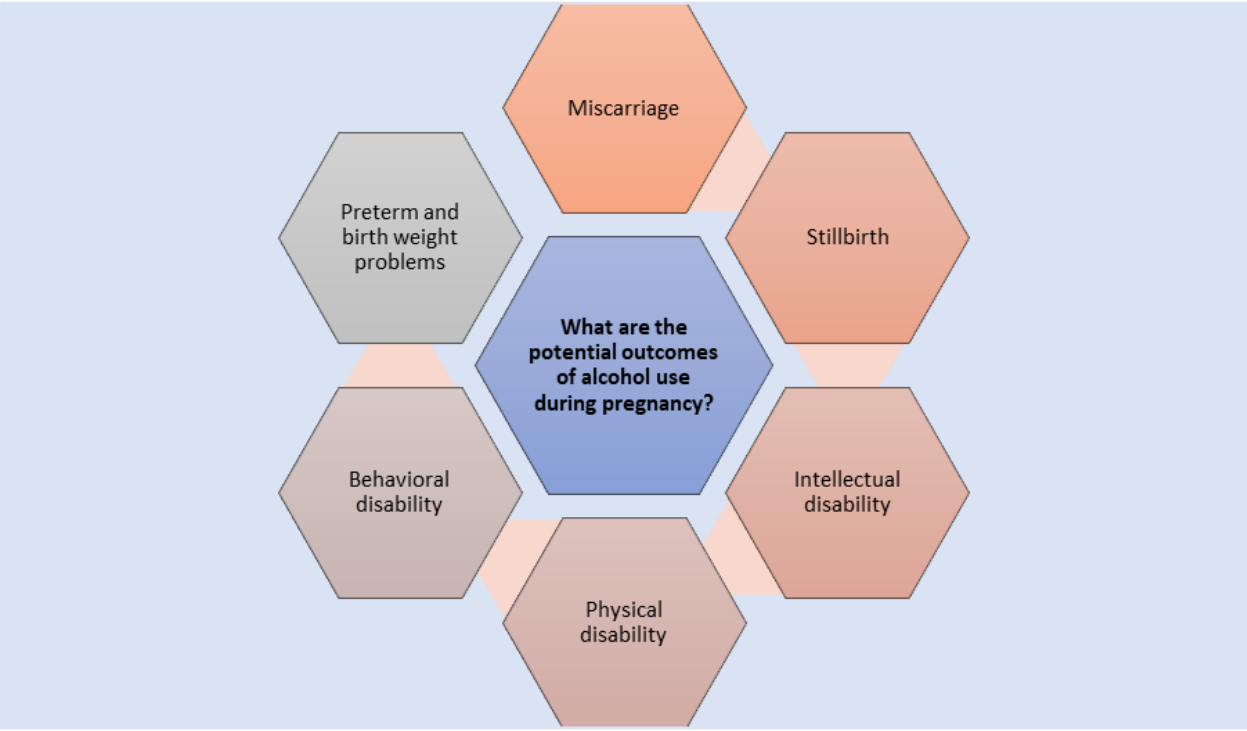

Figure No 1. Potential outcomes of alcohol use during pregnancy.

Background

Fetal alcohol exposure is a big concern for expectant mothers and the effects it may have on the fetus; however, many expectant mothers have come forward saying they believe it is okay to drink a glass of wine a day during pregnancy and have not seen any adverse effects. In a cross-cultural study between England and Sweden, mothers from England believed it was the mother's right and responsibility to make their own choices about the unborn child concerning drinking on special occasions and what they felt was safe [4]. Although this issue is a known and modifiable risk factor for adverse pregnancy and birth outcomes, mothers still refuse to abstain from alcohol use during pregnancy.

Despite known teratogenic effects of alcohol, some studies find positive correlations between alcohol use and future childhood behavioral and cognitive outcomes. The mixed evidence associated with alcohol use in pregnancy and future childhood outcomes could be comparable to confounding variables related to alcohol use in pregnancy [5]. Addlia *et al.* [6] found the strongest influencers to alcohol consumption in pregnancy were depression, partner's use, lack of

knowledge regarding harmful effects, and unplanned pregnancy (see Figure 2). Other factors identified were low education level, low income, unmarried, previous pregnancy complications, and smoking [6]. However, another study found that children from ages three to eleven who had been exposed to light alcohol intake (two or fewer reported drinks per week) during gestation had no significant differences in cognition, behavioral, and psychological outcomes than those who had no reported exposure to alcohol during gestation [5].

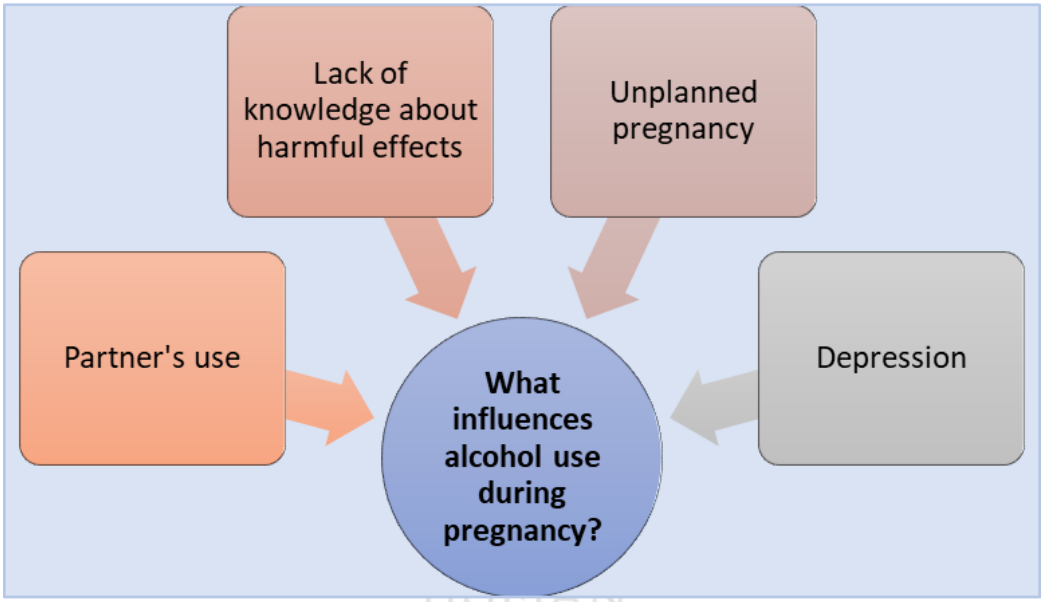

Figure No. 2. Factors that influence alcohol use during pregnancy.

Current beliefs about alcohol consumption differ all around the world. In a study examining nine different European cohorts, the authors conclude Europe had the highest worldwide rates with a quarter of pregnant women drinking alcohol in pregnancy [7]. In Sub-Saharan Africa, a study was done comparing different countries of this region. A total of 30 studies with 17,908 participants were used and the review indicated the prevalence of alcohol consumption varied across countries. The countries differed from the prevalence of 4.3% in one country to the highest prevalence of 59.28% in another part of the country [6]. Different cultures and countries have different perceptions and opinions on alcohol use during pregnancy, and several women rely on their personal experiences rather than research about the danger of alcohol in pregnancy.

Another interesting view on the prevalence of alcohol use in pregnancy could be related to pregnancy being a significant commercial threat to the alcohol industry. Pregnancy can change a

women's long-term drinking patterns which can represent a threat to alcohol sales. Lim *et al.* [8] attribute discrepancies in understanding the effects of alcohol to the alcohol industry who equate "light drinking" to abstinence itself. Terms used by alcohol industries to avoid harm to their business have contributed to the confusion for pregnant women's information when researching the safety of alcohol consumption during pregnancy [8]. In trying to protect the female market, alcohol industries' advertisements portray the idea that alcohol use can be accepted in pregnancy to the public.

METHOD

A search of the literature was performed to identify key outcomes related to alcohol intake during pregnancy and pregnant women's perspectives on alcohol consumption. Specific focus was placed on studies with the phrases light and moderate alcohol consumption. This review was done by identifying literature published between 2017 and 2021 from CINAHL. One article from 2007 was used for background information and because of its high level of evidence and relevancy to this topic. The key terms of drinking alcohol, in pregnancy, childbirth, light alcohol, and prenatal exposure delayed effects, were used to limit the search. A brief search of related studies from PubMed was conducted. A total of 485 peer-reviewed studies were identified using the key terms listed above and 18 were used in this study (see Table 1).

Table No. 1. Methods for Data Collection for Effects of Minimal Alcohol Use During Pregnancy

Database	Search Parameters	Articles Found	Articles Excluded	Reasons for Exclusion	Studies Used
CINAHL	Key terms: drinking alcohol, light alcohol, in pregnancy, childbirth, and prenatal exposure delayed	454	433	Only on heavy-alcohol drinking. No distinction between the amount of consumption of alcohol in the study.	15

	effects Limitations: Between January 2017- October 2021; English; academic peer-reviewed journals			No distinction between alcohol and other substance use (nicotine, marijuana, opioids, and caffeine). Focus on maternal mortality and alcohol consumption. Focus on parental alcohol consumption after childbirth.	
PubMed	Key terms: Light alcohol drinking and in pregnancy Limitations: Between January 2017 and October 2021; English; academic peer-reviewed journals	31	27	No distinction between the amount of alcohol consumption. No distinction between alcohol and other substance use (nicotine, marijuana, opioids, and caffeine).	3

Relevancy Based on Level of Evidence

The level of evidence of each selected study was assessed using the evidence hierarchy [9]. Level one studies were deemed most relevant and included meta-analyses, systematic reviews of randomized controlled trials, and current practice guidelines. The lowest level of evidence is a seven on this scale. All the studies for this review fit into levels I, IV, and VI, with most of the studies ranking a level I. No controlled trials were found with or without randomization because of the nature of the topic, as it would be unethical to control a woman's choice to drink alcohol in pregnancy and how much alcohol women consume. Studies were also assessed based on currency and relevance to the specific topic of light to moderate alcohol drinking in pregnancy and infant outcomes.

Definitions of Key Terms

The key terms of *drinking alcohol, in pregnancy, childbirth, light alcohol, and prenatal exposure delayed effects* were used to select studies within the indicated years and databases. *Drinking alcohol* refers to all amounts of alcohol consumption. *In pregnancy* was used to limit the search to only maternal alcohol consumption during the gestational period. *Childbirth*, referring to during the period of pregnancy and labor, and *light alcohol*, a set alcohol amount category determined by each study individually, were used to further limit the studies found. No studies were identified relating to alcohol consumption during labor. The key term of *prenatal exposure delayed effects* refers to the analysis of effects of alcohol consumption in later childhood and included studies about neuropsychological and behavior outcomes after mothers reported some level of alcohol consumption in pregnancy. These key terms also included studies on alcohol consumption during breastfeeding. From these key terms, we identified the studies used in this literature review.

FINDINGS

Through the literature search, major themes were identified. Findings included low birth weight, preterm birth, miscarriage, and neuropsychological outcomes in children and their association with minimal alcohol consumption throughout pregnancy. Findings are summarized below.

Low Birth Weight

One of the most prominent effects of alcohol use in pregnancy is the low birth weight of the newborn. It is important to note that smoking is strongly associated with alcohol consumption, thus making it difficult to determine the effects of alcohol alone on the fetus [10]. In a cohort study done in the United Kingdom, comparing women with an intake of less than 84 g of alcohol per week, the results were conflicting. The results of another study were a higher risk of low birth weight with the consumption of less than 2.4 g alcohol per day. It was also found that drinking could have a protective effect on the fetus and the mean birth weight was slightly higher [10].

Strandberg-Larsen *et al.* [7] stated in a European meta-analysis studying effects of light-to-moderate alcohol use in pregnancy, regarding birth weight, no mean differences were found for intake up to around three drinks per week when compared to abstaining. The risk for low birth weight was higher in women who consumed three or more drinks per week. In addressing this controversial topic, Reynolds *et al.* [11] stated, women who have consumed alcohol before realizing that they were pregnant or who consumed alcohol in light amounts during early pregnancy, may be reassured that their alcohol consumption did not impact adversely on their baby's growth. Inconsistent findings on the amount of alcohol consumed and low birth weight were also found.

One of the reasons the use of alcohol is such a dangerous teratogen is that it crosses the placenta from mother to fetus within two hours after maternal intake [2]. The fetal alcohol metabolism is slower than in the mother so there may be higher levels of alcohol sustained longer in fetal blood than in maternal blood [2]. The risk factors of alcohol use in pregnancy result in irreversible complications, and recommendations must be made carefully. Dumas *et al.* [12] highly caution research done without clarifying the different types of drinking patterns. This could result in confusing women with different risk factors and increases the risk for poor pregnancy outcomes.

Preterm Birth

Regarding preterm birth, a large cohort study was done in Japan and included 94,349 singleton pregnancies [13]. They found that alcohol consumption during the first trimester was not

associated with the risk of preterm delivery. They also found that heavy alcohol consumption in the second and third trimesters was associated with an increased risk of preterm delivery among pregnant women. The findings for the Japanese study were consistent with a Danish study which showed that 10 or more drinks per week at 16-30 weeks gestation resulted in up to 3.6 times higher risk of preterm delivery. With heavy alcohol consumption, the alcohol may induce preterm delivery by increasing secretion of prostaglandins which stimulates uterine contractions. Regarding light to moderate alcohol consumption, this study did not find any conclusive reason why the risk for preterm delivery was reduced in the first trimester but remained high in the second and third trimesters [13].

Other researchers ended their studies with the conclusion that even light drinking of less than 32 g of alcohol per week has been associated with being small for gestational age and with preterm delivery [8]. These contradicting conclusions contribute to the confusion for pregnant mothers or healthcare professionals who are attempting to research this topic. Henderson *et al.* [10] revealed that two case-controlled studies which considered preterm birth as an outcome of light alcohol consumption had possible bias and failed to control for potential confounders which lead them to an incorrect conclusion. They also found either no effect or a reduction in risk of prematurity with the consumption of up to 72 g of alcohol per week [10].

Weile *et al.* [14] explained the preterm birth risk associated with alcohol intake. Alcohol in early pregnancy may predispose to spontaneous preterm birth by causing impaired trophoblast invasion and placental development subsequently altering the levels of prostaglandins, progesterone, and inflammatory cytokines. Alcohol use and the risk of preterm birth in the early pregnancy may happen because of the teratogenic effects of the alcohol, even in smaller amounts [14].

Miscarriage

Miscarriage is a common complication that is difficult to determine the definitive causative factors. Sundermann *et al.* [15] found that pregnancies with alcohol use were 19% more likely to end in miscarriage. With alcohol use of five or fewer drinks per week, each additional drink per week in pregnancy is associated with a 13% increase in the risk of miscarriage. The risk of miscarriage increases with alcohol use but is also dose-dependent. It is important to note that

many of these studies' results vary based not only on the amount of alcohol consumed but also with which trimester most of the alcohol was consumed.

Henderson *et al.* [10] found that out of eight studies, five had a significantly higher risk of miscarriage to women consuming less than 84 g of alcohol per week was interpreted as less than one drink per day. There was a strong relationship between smoking and alcohol consumption of the mothers which could also contribute to the risk of miscarriage. Avalos *et al.* [16] concluded that there is a relationship between miscarriage and four or more drinks per week, but those patterns did not persist for alcohol intake of fewer than four drinks per week. This study was concluded by acknowledging that the relationship between miscarriage and alcohol intake was strongest for early miscarriage of fewer than 10 weeks gestation. From these findings, miscarriage may occur at higher rates in those who consume alcohol, but no specific amount can be identified.

Neuropsychological Outcomes in Children

An observational study over a decade followed 51 preschoolers of nonalcohol-dependent mothers who had one to five drinking episodes in their first trimester as compared to 51 children not exposed to any known teratogens in utero [2]. They found behavioral differences in the children exposed to alcohol, but no differences regarding physical, cognitive, or language abilities. Studies done on older children ranging from ages 3-16 years showed subtle long-term effects such as mental health problems, inattention, and problems with short-term memory [2]. However, based on evidence from several studies, Mamluket *et al.* [17] found a likely causal detrimental role of prenatal alcohol exposure on cognitive outcomes and weaker evidence for a role in low birth weight.

Flak *et al.* [18] reviewed three high-quality studies performed on 11,900 children ranging from ages nine months to five years. They observed significantly detrimental outcomes that were associated between child behavior and moderate prenatal exposure to alcohol. However, part of what contributes to the controversy over alcohol use in pregnancy is shown by an example in seven lower quality studies done on 26,100 children. A statistically significant beneficial association was observed between cognition and mild-to-moderate alcohol exposure. This meta-analysis was the first known study with moderate levels of alcohol consumption of less than one

drink per day negatively affecting child behavior. However, consistent evidence that mild or moderate prenatal exposure was related to negative child neuropsychological outcomes was not found in this meta-analysis [18].

In a study done with pre-adolescents exposed to different levels of alcohol during pregnancy, the researchers concluded, early, light exposure, compared with no exposure, was associated with better attention and inhibitory skills [19]. The definition of "early, light exposure" was not given and most of the study replicated other studies in saying that overall, children exposed to alcohol in utero have much higher rates of mental disorders, attention deficits, and impulsiveness. Negative neuropsychological outcomes in children were correlated with alcohol consumption in utero.

Summary of Findings

In this literature review, studies were identified on minimal alcohol use during pregnancy to offer a further glimpse into its effects or lack of effects. Prominent themes discovered in the literature review were preterm birth, low birth weight, miscarriage, and neuropsychological outcomes in children and can be found in Figure 3. The overarching themes could all be detrimental to the fetus and possibly result from drinking alcohol while pregnant. The question that still stands is how much alcohol this is? After reviewing several high-level research studies there is still much controversy regarding drinking alcohol during pregnancy and defining what light to moderate amounts of alcohol are.

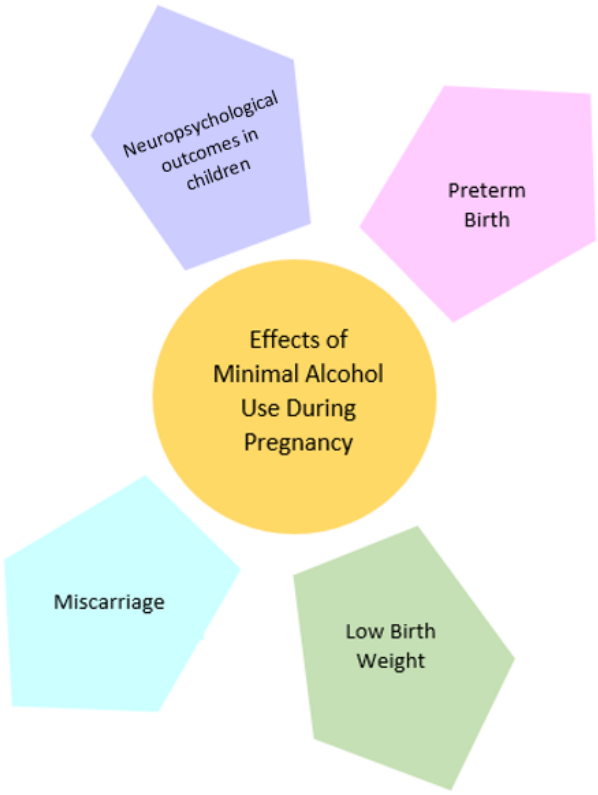

Figure No 3. Emerging themes of minimal alcohol use during pregnancy

Overall, the research findings indicate controversy regarding alcohol use during pregnancy. There is a controversy between adverse effects and alcohol consumption at various amounts in the research. There are too many other varying factors involved to conclude this with confidence. Furthermore, no set amount of alcohol has been identified as too much or a concrete definition of what is a moderate amount of alcohol. Alcohol should be avoided in general if possible. There is minimal research conducted in the United States on this issue, and there is a disconnect between known research and implemented education evidenced by mothers who continue to drink throughout their pregnancies. There are often misconceptions and differing opinions about maintaining moderate alcohol in pregnancy.

DISCUSSION

Based on the research identified in this review alcohol abstinence should still be advised in pregnancy due to the unknown risks of light to moderate alcohol consumption on the fetus and the future neuropsychological outcomes of the child. Considering the question, in expectant

mothers, how does light to moderate alcohol consumption compared to complete abstinence influence infant complications throughout and after pregnancy, women should be advised that not enough research has been done regarding light-moderate alcohol consumption and its short and long-term effects. This research is especially lacking in the United States.

Mixed Findings

Research is mixed on the correlation between light to moderate alcohol consumption and the outcomes of low birth weight, preterm birth, miscarriage, and neuropsychological outcomes in children. There was not enough information or consistency in many of the studies for the researchers to conclude a safe amount of alcohol ingested during pregnancy [5,19]. Despite known teratogenic effects of alcohol, some studies find positive correlations between alcohol use and future childhood behavioral and cognitive outcomes. The mixed evidence related to alcohol use in pregnancy and future childhood outcomes could be related to confounding variables with alcohol use in pregnancy [5].

The research was often indicated as limited due to unknown and uncontrollable variables [6,8,11,12,14,15]. Addlia *et al*. [6] found the strongest influencers to alcohol consumption in pregnancy were depression, partner's use, lack of knowledge regarding harmful effects, and unplanned pregnancy. More research in other influencing factors would be needed to separate alcohol use from confounding variables in fetal development and outcomes of the infant. This may not be possible because of the limited number of people in each cohort who used different combinations of substances and adhered to different practices during their pregnancy that could all affect the fetus and future infant and child's development.

Confounding Variables

Social and demographic factors. Social and demographic factors were identified by the researchers in seven studies to have a major impact on a woman's choice to consume alcohol [2,4,5,6,12-14]. Higher socioeconomic status was associated with lower amounts of alcohol consumption during pregnancy in studies that surveyed income and factors such as marital status and career (see Figure 4). Additionally, ethnicity and other demographic information often had statistical differences in the amount of alcohol consumed, and researchers adjusted for these

differences when applicable. Knowing that a woman's choice to drink during pregnancy and the amount she chooses to drink is affected by her socioeconomic status and demographics should be considered when making decisions for practice. The amount of alcohol consumption is only one of the broad range of factors that can affect the developing fetus and the infant's future cognitive ability and neuropsychological outcomes. It is therefore hard to separate alcohol from other factors that may be causing the negative outcomes observed.

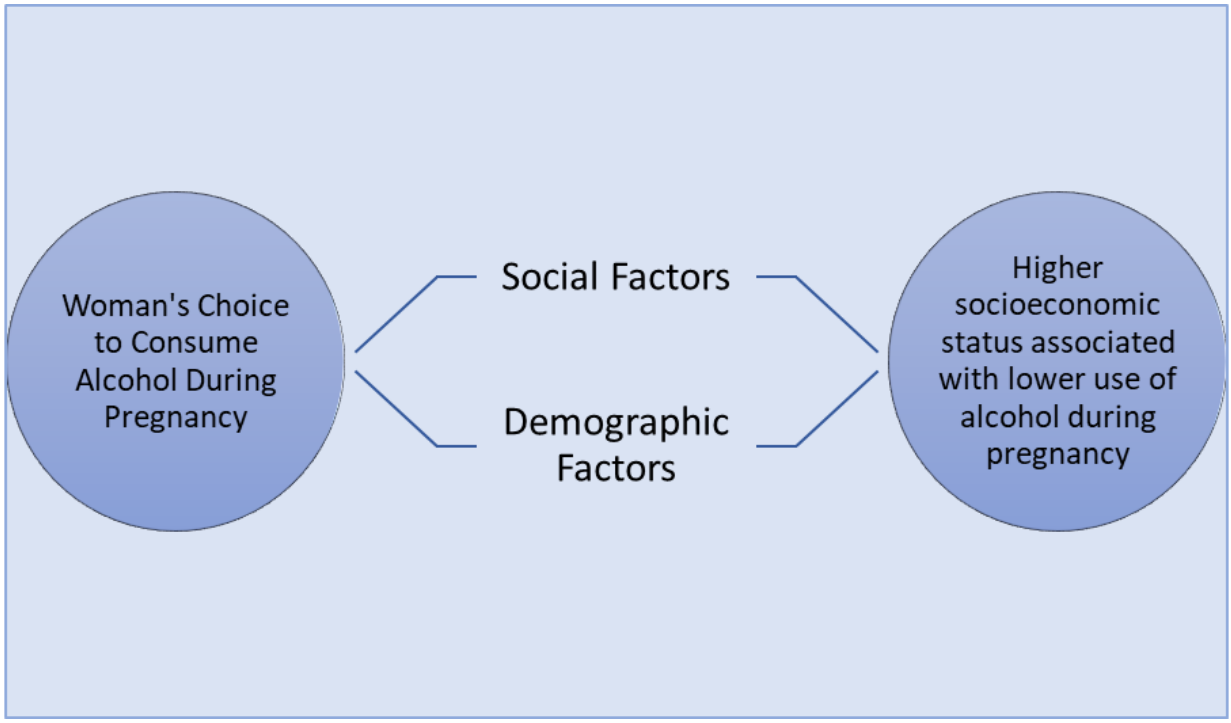

Figure No 4. Social and demographic factors for woman's choice to consume alcohol.

Cognitive and educational factors. Mothers who reported light alcohol consumption were associated with higher cognitive scoring children [5]. A mother's cognitive ability and education level were strongly associated with children's cognitive and neuropsychological outcomes [2,4-6,12-14,19]. Lees *et al.* [19] focused on how medications children took at the time of cognitive testing were associated with considerable differences in cognitive function and that a slightly positive correlation existed between light alcohol use and neurodevelopment. The cognitive function and education level of both mother and the future child could affect statistics when considering alcohol ingestion of the mother during pregnancy and the future neuropsychological capabilities of the child.

Smoking and other health factors. As shown in Figure 5, **s**moking was associated with higher levels of alcohol intake in pregnancy [5,6,13]. Other factors associated with higher levels of alcohol intake were diagnosis of maternal medical conditions, previous pregnancy complications, use of illicit drugs, high folate intake, higher levels of physical activity [2,4,6,11-13]. The number of correlating factors with higher consumption of alcohol during pregnancy could influence the effects of alcohol exposure on the fetus even in small amounts. Considering associations between confounding health practices and conditions with infant outcomes is necessary because of the effects other substances and health conditions can have on the infant similar to the known teratogenic effects of alcohol.

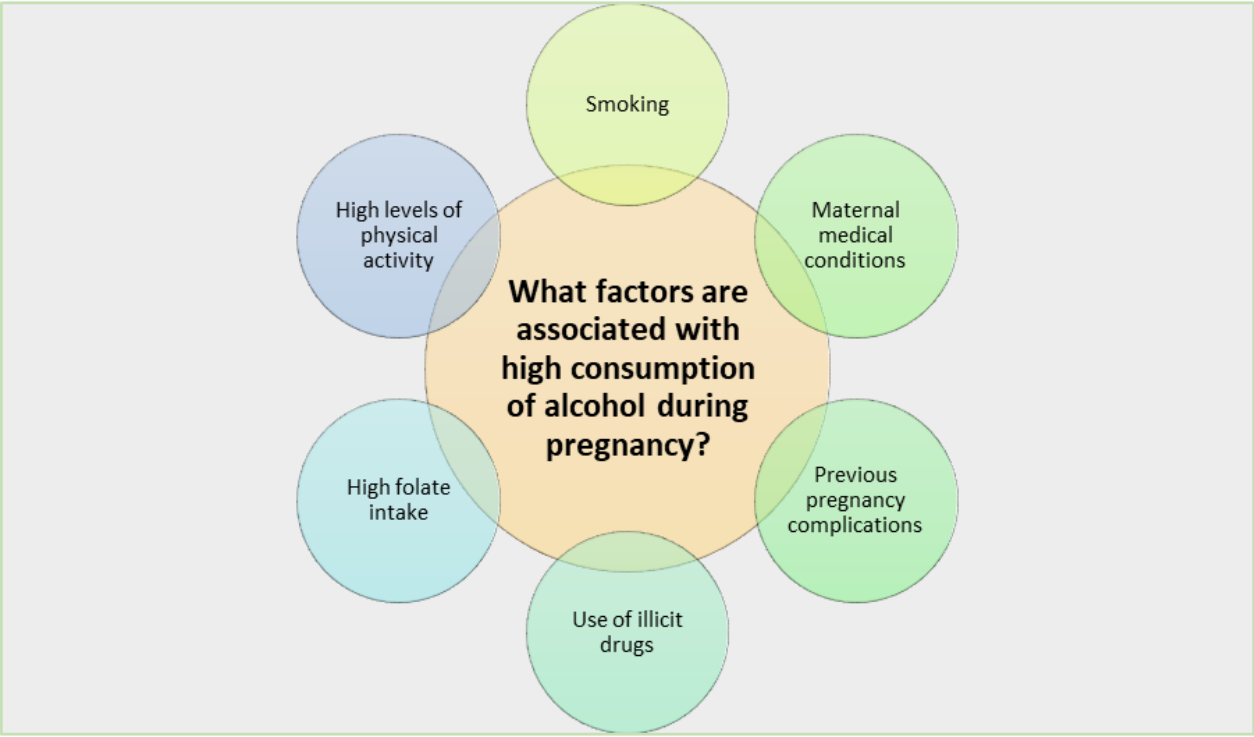

Figure No 5. Factors associated with high levels of alcohol consumption during pregnancy.

Timing of alcohol consumption. An inadequate amount of research was evident about the influence of when the alcohol was consumed during the pregnancy. Differences between the effects of alcohol exposure in the first, second, and third trimesters were only examined in three studies in this review. Dumas *et al.* [12] found that alcohol intake was greater among pregnant mothers in early pregnancy than later. Ikehara *et al*. [13] focused on first-trimester pregnancy and found that there was no association between preterm birth and the amount of alcohol

consumed. Other researchers indicated that one of the weaknesses of their studies was a lack of knowledge as to the time of alcohol consumption during pregnancy and that finding participants to examine the amount in early pregnancy was most difficult [14,15]. The timing of alcohol consumption with the gestational age of exposure would be another important confounding variable to the outcomes seen with birth, infant, and child outcomes.

Lack of Standard Definitions

There is no standard definition as to the amount of alcohol that the terms light, moderate, or heavy represent [5,11,13,15]. Scales used to identify how much alcohol a pregnant woman drank differed in units of measure and vary based on the studies' country of origin. Common measures were grams of ethanol per week [10,13], units per week [11,19], or drinks per week [7,14,15].

Sundermann *et al.* [15] attempted to set a standard definition of light to moderate alcohol drinking as less than five drinks per week. DeJong *et al.* [2] set the standard for moderate alcohol drinking at one or fewer drinks per day with a standard drink defined as 0.6 fluid ounces of pure ethanol. The inconsistencies in the definitions of such terms are one of the main issues in defining a set amount of alcohol that is considered safe to drink in pregnancy as some studies may indicate. Caution should be taken when interpreting a safe amount of alcohol because overestimation could lead to poor outcomes and fetal alcohol spectrum disorders [5]. Advisement of women on alcohol use during pregnancy must be done with the consideration that small differences in the amount of alcohol consumed could have large effects on fetal development and infant outcomes. Since no standard amounts of alcohol are used in most studies, no standard amount of alcohol can be considered safe in pregnancy. Howlett *et al.* [20] identified a need for training in alcohol screening in pregnancy to improve awareness and recognition by professionals. This could improve patient care.

Strengths

One of the strengths of this review was the availability of high-level evidence. Of the studies used in this systemic review, most were either meta-analyses, systemic reviews, or current practice guidelines. Studies were also current as they were published within the past five years. Older studies were used only when very relevant to the topic of minimal alcohol use during

pregnancy. The wide variety of previous research related to any alcohol use amount in pregnancy provided an expansive foundation for further research specific to minimal alcohol use.

Another strength was this review's applicability to clinical practice. Client advisement on alcohol consumption happens at the clinical level and findings from this review could be used to guide current practice. A goal of this review was to find evidence that could be applied to the clinical level when working with pregnant clients. Confounding factors that are associated with increased or decreased maternal alcohol intake during pregnancy must be considered when applying knowledge of the effects of minimal alcohol use in pregnancy to clinical practice.

Weaknesses

Weaknesses for this study included lack of uniformity in the definition of light to moderate alcohol drinking, lack of variety in studies found, and the number of uncontrollable factors that coincide with the topic of alcohol use in pregnancy. Studies found greatly varied in their definitions regarding the amount of alcohol consumed. Many researchers did not differentiate between the amount of alcohol used or focused solely on heavy alcohol consumption and fetal alcohol spectrum disorders. A lack of controlled trials in the evidence hierarchy was noticed in this systematic review. Controlled trials with and without randomization were lacking because of the ethical barriers related to controlled trials and alcohol consumption during pregnancy.

The use of cohort and qualitative studies was necessary because of the lack of controlled trials about alcohol use in pregnancy. With all the cohort studies and qualitative studies used in this review, the researchers used some form of self-report through interviews or surveys to determine the amount of alcohol consumption in participants during pregnancy. This could be a particular problem to results because of underreporting and stigma associated with alcohol consumption, especially during pregnancy. Additional issues with self-reporting of alcohol ingestion during pregnancy could include the inability of the woman to recall and thus reduced accuracy of the information and the underreporting of other substances that may have been used in pregnancy due to stigma or fear of legal penalty for illegal substances.

The number of uncontrollable variables related to alcohol use during pregnancy could also be considered a weakness to this study. Other teratogenic substances and poor habits during

pregnancy coexisted with alcohol consumption. Even with analysis to account for these variables, it is impossible to conclusively find that alcohol consumption was the root cause of future infant/child outcomes.

Recommendations

Further research would be necessary specifically related to light to moderate alcohol intake in pregnancy with a standard definition of light, moderate, and heavy alcohol drinking. It is not possible to conclude that a specific amount of alcohol intake in pregnancy is okay because of this lack of research and a lack of standard definitions. Alcohol can have a wide range of effects on the fetus, infant, and future child, ranging from physical to behavioral and neuropsychological outcomes, as well as effects that may not be known or have not been researched yet. There is particularly a lack of research related to light to moderate alcohol consumption during pregnancy in the United States, as much of the research found came from foreign countries. This raises concern because many women in the United States do drink alcohol in pregnancy despite clinical guidelines and research that caution its use in any amount.

More research is also needed about the factors that influence the mother's choice to consume light to moderate alcohol in pregnancy and what barriers exist to abstinence during pregnancy since alcohol is a known teratogenic substance and research regarding effects of light to moderate alcohol use is lacking and mixed. Interventions directed at these factors would be necessary to reduce the number of women and the number of women who drink during pregnancy and go beyond simply providing education to women about possible outcomes with any amount of alcohol use during their pregnancy. Since reasons for alcohol consumption identified in this study were multifactual, interventions must focus on several factors as well. Women must be informed about the mixed results and risks of even consuming small amounts of alcohol in pregnancy so that they can make informed choices for themselves.

CONCLUSION

In conclusion, there are varying opinions on alcohol use during pregnancy and the effects. Four major themes were identified as increased risk of low birth weight, preterm birth, miscarriage, and poor neuropsychological outcomes. Other confounding variables were found to impact a

woman's choice to consume alcohol including social, demographic, cognitive, and educational factors. Based on the research identified in this review, alcohol abstinence should still be advised in pregnancy due to the unknown risks on the fetus both short and long term.

Further research and a standard definition of light to moderate alcohol intake are needed to understand the full relationship between the level of alcohol consumption in pregnancy and infant outcomes. There was not enough information or consistency to conclude a safe amount of alcohol ingested during pregnancy. Women should still be advised to abstain from alcohol in pregnancy due to the lack of research and the mixed results regarding light to moderate alcohol consumption.

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