

Pregnant Women's Knowledge About Alcohol Consumption During Pregnancy and its Consequences: An Israeli Survey

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Abstract

Background. Alcohol consumption can negatively affect fetal development, resulting in a range of mental and physical disabilities clinically termed fetal alcohol spectrum disorders (FASD). Despite suspected rates of maternal drinking during pregnancy, the documented number of children diagnosed with FASD in Israel is extremely low. The aim of this study was to investigate alcohol-consumption behavior and knowledge about the consequences of such consumption among pregnant Israeli women.

Methods. A sample of 802 pregnant women completed an anonymous online survey related to their backgrounds, recommendations and education on alcohol consumption during pregnancy, general knowledge regarding the consequences of alcohol consumption during pregnancy and FASD, and alcohol they consumed (frequency and amount) 2 mo prior to conception and during pregnancy. Descriptive statistics included means, standard deviations, ranges, and frequencies. Associations between demographic characteristics and alcohol consumption were assessed using chi-square tests, independent sample *t* tests, one-way analyses of variances, and Spearman correlations.

Results. Of the 802 women sampled, 539 (67.2%) reported drinking alcohol in the 2 mo prior to learning they were pregnant, 96 (12%) reported drinking alcohol during their current pregnancy, and 28.1% reported knowing other women who had consumed alcohol during pregnancy. Higher alcohol consumption rates before pregnancy were found among women in their first pregnancies, women with advance education, Jews, and secular women. About 40% of the sample reported they had not received any education about the dangers of consuming alcohol during pregnancy.

Conclusions. A high percentage of pregnant women in Israel drank alcohol close to conception and during pregnancy. Although most of the woman ceased drinking after realizing they were pregnant, a still-worrying percentage continued consuming alcohol and had low knowledge and awareness of the plausible dangers of this behavior. Formal dissemination of information on this topic by healthcare professionals treating pregnant woman did not reach many of them. The results emphasize an urgent need for better education of both professionals and the lay public to increase awareness of the consequences of consuming alcohol during pregnancy.

Background

Consumption of alcohol can negatively affect fetal development, resulting in a range of mental and physical disabilities clinically termed fetal alcohol spectrum disorders (FASD) [1]. Alcohol consumption is common in many cultures. Worldwide over the past 30 year, young women have been consuming more alcohol, with an increasingly frequent pattern of risky (“binge”) drinking (i.e., four or more drinks in about 2 hr) [2] and increased risk of unintentional alcohol consumption during pregnancy [3]. Nearly one in 10 (9.8%) women in the general population consume alcohol during pregnancy [4]. Over the 47 year since Jones and Smith first described fetal alcohol syndrome (FAS) in the English literature [5], knowledge of negative consequences of prenatal alcohol consumption has increased exponentially [6]. Cumulative evidence and knowledge have led to the understanding that prenatal alcohol exposure (PAE) is one of the leading causes of intellectual and developmental disabilities and can result in irreversible lifelong consequences for the unborn child [2].

The term FASD encompasses various diagnostic subtypes: FAS, partial FAS, alcohol-related neurodevelopmental disorder, alcohol-related birth defects, and neurobehavioral disorder with PAE [7, 8]. The severity of FASD may depend on the level, pattern, and timing of PAE before and during pregnancy [9, 10] and other confounding factors, such as the mother’s nutritional status (e.g., food, vitamin, and mineral intake), abuse of other substances, environmental factors (e.g., social relationships and stress), maternal age, and genetic makeup [2]. The manifestations associated with FASD are heterogeneous, including highly specific dysmorphia, prenatal and/or postnatal growth deficiency, nonspecific birth defects, neurodevelopmental abnormalities, and neuroanatomic defects [11, 12]. Individuals with histories of PAE are at risk for problems in mental health, school, the justice system, and independent living in general [13].

Although there is conclusive evidence that alcohol is teratogenic, human studies have failed to elucidate the dose-response relationship between alcohol and FASD [14]. Specifically, mothers of children diagnosed in the FASD spectrum reported drinking levels ranging from mild to excessive (“binge”) drinking [15, 16]. As yet, there is no known safe amount of alcohol that can be drink consumed while pregnant [7, 17]. Given that the pattern, amount, and PAE critical period necessary for structural or functional teratogenesis are unknown, women are advised to completely abstain from alcohol when they are trying to become pregnant and during their entire pregnancy [4].

Epidemiological research implies that FASD is a worldwide problem [2]. It was recently estimated that approximately one in every 13 prenatally alcohol exposed infants will have FASD, which results in approximately 630,000 affected infants in the world who will develop FASD each year. Furthermore, the prevalence of FASD in populations of younger school children may be as high as 2–5% in the United States and some Western European countries [18]. The incidence is particularly high for children in orphanages and foster care [19]. A lack of consistent diagnostic criteria across countries contributes to the difficulty establishing accurate prevalence rates and identifying relevant resources for affected individuals [20].

Despite the available evidence and knowledge about the irreversible lifelong consequences of alcohol consumption during pregnancy, surveys revealed that its rates are certainly not negligible: They tend to be higher than 10%. For example, Popova et al.’s comprehensive systematic literature searches and meta-analyses assuming a random-effects model revealed that about 10% and 15% of pregnant women in the general populations of Canada and the United States, respectively, consume alcohol and that about 3% of women in both countries engage in binge drinking during pregnancy [4].

According to the Organization for Economic Co-operation and Development, the rate of alcohol consumption in the general population of Israel is rising [21]. So far, only one study has been conducted on the topic of alcohol consumption during pregnancy in Israel, and it was carried out 10 year ago [22]. In that study, 3,815 recent mothers in a maternity ward completed an ad hoc questionnaire on alcohol consumption, their personal drinking habits during pregnancy, the relationship of background factors to alcohol consumption during pregnancy, and the information regarding alcohol consumption during pregnancy they had received from medical authorities. The researchers reported a 14.1% rate of alcohol consumption during pregnancy, with higher risks among older women,

women with first pregnancies, and secular women. Among religious groups, the percentage of women who reported drinking alcohol (15.5% for Jewish women, 11.1% for Christians, and 0 for Muslims) was lower than the percentage who claimed they knew someone who drank alcohol during pregnancy (26%, 27.8%, and 4.8%, respectively), suggesting that the problem may be even more widespread than the data indicated [22]. Therefore, the first aim of the present study was to obtain an up-to-date estimation of alcohol-consumption behavior of pregnant women in Israel.

Despite these suspected rates of maternal drinking during pregnancy, the documented number of children diagnosed with FASD in Israel is extremely low [19]. Based on previous studies, health care professionals lack knowledge, awareness, and training regarding the prevalence of maternal drinking and the diverse manifestations of FASD, which might explain the huge discrepancy between the estimated rate of alcohol consumption during pregnancy and FASD-diagnosed cases in Israel. Senecky et al. reported that during a 10-yr period (1998–2007), only six patients were listed with a diagnosis of FASD in two of the four health maintenance organizations that provide universal health coverage for Israeli citizens [23]. Their study was the first to address FASD in Israel. Only three more studies dealing with FASD in Israel have been published since 2009. Tenenbaum and colleagues published two studies investigating FASD among adopted children and containing retrospective analyses [19, 24]. The first reported that 15% of 100 children under the age of 2 year at an adoption clinic met or would meet the criteria for an FASD diagnosis at an older age if neurocognitive disabilities or certain dysmorphic characteristics became recognizable [24]. The second study aimed to determine the prevalence or risk of FASD in a selected population of foster and adopted children aged 2.16 to 11.0 year. In this group of 89 children evaluated in a national medical adoption unit, 20.2% had in utero exposure to alcohol, and nearly half met the criteria for an FASD diagnosis. According to the researchers, the high rate of both FASD and the risk for developing FASD aligned with research from other countries [19]. Fisher et al. published the third research, analyzing 237 files of children and adolescents with behavioral and educational challenges [25]. Their results suggested that the prevalence of FASD might be as high as 16% of the population of children and adolescents enrolled at Bnei Arazim, an education and behavior correctional facility in central Israel. However, none of the children in that study had a formal diagnosis of FASD, and all the children with suspected FASD had been previously diagnosed with other conditions, such as ADHD, conduct disorder, or general anxiety disorder at a mean age of 7 year. These studies suggested that despite the low rates of formal FASD diagnoses, the actual rates of children affected by prenatal exposure to alcohol in Israel might be similar to the rates in other countries. In other words, many affected children remain undetected by the medical system and do not receive a proper diagnosis.

A further problem in Israel seems to be the lack of knowledge in the general population, and specifically among pregnant women, about the dangers of alcohol consumption during pregnancy. The results from the single survey Senecky et al. conducted 10 year ago (discussed earlier) found that only a minority of women received adequate information regarding alcohol consumption from medical professionals during pregnancy surveillance [22]. However, awareness of this topic might have improved over the years, especially given the availability of online information and widespread knowledge that characterized the last decade. Therefore, the second aim of the present study was to investigate pregnant women's knowledge about the consequences of alcohol consumption during pregnancy.

To summarize, the aims of our study were to investigate consumption behavior and knowledge about the consequences of such consumption among pregnant Israeli women. We asked pregnant women to report about alcohol consumption before and during pregnancy for themselves and for other pregnant women they know, which might be less intimidating and easier to report. Moreover, we included comparison questions about smoking and sushi (both of which are advised against in Israel) due to their hazardous effect on the fetus. Sociodemographic measures also were included to be tested as predictors of participants' knowledge level about the consequences of alcohol consumption during pregnancy and about FASD.

Methods

Sample

The sample included 802 women with a mean age of 30.76 year (19–45 year, $SD = 4.58$). The average pregnancy week was 23.27 ($SD = 10.52$); 18.6% of the women were in high-risk pregnancies; and the majority (87%) of the sample had medical follow-up during pregnancy. We recruited study participants through online advertisements and social media, as well as through word of mouth. Then, to create a statistically representative sample of the Israeli population in terms of ethnicity, age, and education level, more participants were recruited through the Midgam Project web panel (MIDGAM). The MIDGAM is an Israeli company that specializes in providing infrastructure for internet research (<http://www.midgampanel.com/research/en/index.asp>). It has access to hundreds of thousands of Israelis interested in participating in online studies, either voluntarily or in exchange for monetary reimbursement. Interested pregnant women signed online consent forms and then were provided a link to an online questionnaire (QualtricsSM).

Procedure and tools

To avoid possible selection bias, the research questionnaire was published in both Hebrew and Arabic. Because the survey was online, anonymous, and developed to be used by women who varied in age, education level, religion, and so forth, it had to be short and clear enough for self-reporting. Based on previous research conducted in Israel 10 year ago [22], the survey items were related to instructions and education the patient had received on alcohol consumption during pregnancy, to their general knowledge regarding the consequences of alcohol consumption during pregnancy and regarding FASD, and to alcohol they consumed (frequency and amount) 2 mo prior to conception and during pregnancy. Additional items covered background data (age, number of previous births, country of birth, and religion/religiosity) and the clinic attended for follow-up during pregnancy (public or private). Further, based on Senecky et al.'s study [22], the survey included questions about the respondents' acquaintance with other women who drank alcohol or smoked during pregnancy.

The survey section that measured knowledge regarding the consequences of alcohol consumption during pregnancy and its dangers was developed for this study (see supplemental material) based on three questionnaires previously used to explore knowledge, attitudes, and behaviors related to FASD across groups of professionals and health services providers [6, 26, 27]. Because participants in the current research were pregnant women without professional

knowledge, adaptations were made to those questionnaires' content and wording. Thus, the related section in this study's survey contained 26 items: 18 assessed knowledge of the effects of alcohol consumption (the mean of these items' ratings measures the level of knowledge), and the rest were fillers related to other habits (nutrition, smoking, and sports) during pregnancy. Participants rated how much they agree with each statement on a Likert scale of 1 (*absolutely agree*) to 5 (*absolutely disagree*). Ten questions were worded in the opposite direction and were reversed before analysis. In the final scale, higher ratings indicate more knowledge. Two of the 18 original items were excluded because they had low internal consistency with the others. Therefore, the final questionnaire used in the analyses for measuring knowledge contains 16 items, for which the reliability was good ($\alpha = .724$). Participants need approximately 10 to 15 minutes to complete the full survey.

The data were analyzed using SPSS software version 25. Descriptive statistics for the demographic characteristics and core variables were performed using means, standard deviations, ranges, and frequencies. Associations between the demographic characteristics and alcohol consumption before and during the pregnancy were assessed using chi-square tests for the discrete variables, independent sample *t* tests, and one-way analyses of variances for the continuous and discrete variables, and Spearman correlations for the ordinal variables. Post hoc analysis alphas were corrected using Bonferroni correction.

Results

Demographic data for the participants are shown in Table 1. Most (90.9%) women in the sample were married, about half (53.2%) had Bachelor's degrees, and, for 38.5% of the women, the current pregnancy was their first.

Table 1
Participants' demographic characteristics (N= 802).

| Characteristic | Mean (SD) | Range | Frequency (%) |
|---------------------|--------------|-------|---------------|
| Age (yr) | 30.76 (4.58) | 19–45 | |
| 19–25 | | | 105 (13.1) |
| 26–34 | | | 532 (66.3) |
| 35–45 | | | 165 (20.6) |
| Religion | | | |
| Jewish | | | 751 (93.6) |
| Muslim | | | 19 (2.4) |
| Christian | | | 22 (2.8) |
| Other | | | 10 (1.2) |
| Residence in Israel | | | |
| North | | | 191 (23.8) |
| Center | | | 358 (44.7) |
| Jerusalem | | | 123 (15.3) |
| South | | | 130 (16.2) |
| %...arital status | | | |
| Single | | | 29 (3.6) |
| Married | | | 729 (90.9) |
| Divorced | | | 4 (0.5) |
| Widow | | | 1 (0.1) |
| In a relationship | | | 39 (4.8) |
| Education | | | |
| High school | | | 130 (16.2) |
| Bachelor degree | | | 427 (53.2) |
| Master's degree | | | 245 (30.5) |
| Number of children | 1.12 (1.30) | 0–13 | |
| 0 | | | 309 (38.5) |
| 1 | | | 253 (31.5) |
| 2 | | | 141 (17.6) |
| 3 | | | 67 (8.4) |
| 4 or more | | | 32 (4.0) |

Consumption of alcohol before and during pregnancy

Of the 802 women in the sample, 539 (67.2%) reported drinking any amount of alcohol in the 2 mo prior to learning they were pregnant, and 96 (12.0%) reported drinking alcohol during their current pregnancy. One-third of the sample did not consume alcohol before the pregnancy (32.8%) or consumed only at a Kiddush or on a holiday (33.3%; Kiddush, literally, "sanctification," is a blessing recited over wine to sanctify the Shabbat and Jewish holy days). During the pregnancy, 88.0% reported consuming no alcohol. Among the women who drank during pregnancy, 63.8% consumed up to half a glass, 33.0% consumed up to one glass, 2.1% consumed up to two glasses, and 1.1% consumed more than two glasses of alcohol (Table 2). Overall, 86.6% of the sample reduced their alcohol consumption after learning of their conception and throughout pregnancy.

Table 2
Reported alcohol consumption behavior before and during pregnancy (N= 802).

| Response | Alcohol consumption before pregnancy (%) | Alcohol consumption during pregnancy (%) |
|------------------------------|--|--|
| No alcohol consumption | 263 (32.8) | 706 (88.0) |
| Some alcohol consumption | 539 (67.2) | 96 (12.0) |
| Frequency if consumed | | |
| At Kiddush or holidays | 267 (33.3) | 33 (4.1) |
| On special occasions | 114 (14.2) | 3 (0.4) |
| Once a week or more | 158 (19.7) | 60 (7.5) |
| Dose (per drinking occasion) | | |
| No more than 1/2 glass | 118 (21.9) | 60 (63.8) |
| ½–1 glass | 273 (50.6) | 31 (33.0) |
| 1–2 glasses | 110 (20.4) | 2 (2.1) |
| More than 2 glasses | 35 (6.5) | 1 (1.1) |

Interestingly, only 12.0% of the sample claimed they consumed alcohol during pregnancy, but 28.1% reported knowing other pregnant women who had. Similarly, there was a large discrepancy between the acknowledgment of self-consumption and the estimation of the consumption rates in the population based on the reports about "other women they know": Only 4.7% of the sample reported smoking during pregnancy, but almost 50% knew other pregnant women who had smoked (Table 3).

Table 3
Acknowledgment of consumption of alcohol and smoking: self-reported versus "other women" (N= 802).

| Response | Smoked during pregnancy (%) | Knew other women who smoked during pregnancy (%) | Consumed alcohol during pregnancy (%) | Knew other women who consumed alcohol during pregnancy (%) |
|----------|-----------------------------|--|---------------------------------------|--|
| Yes | 38 (4.7) | 392 (48.9) | 96 (12.0) | 225 (28.1) |
| No | 763 (95.1) | 410 (51.1) | 706 (88.0) | 577 (71.9) |

Associations between consumption and demographic characteristics

To assess the associations between demographic variables and alcohol consumption before and during pregnancy, we conducted chi-square tests. The results presented in Table 4 show that alcohol consumption before pregnancy was relatively low among women between the ages of 19 and 25 year ($\chi^2 = 7.62, p = .02$). However, higher alcohol consumption rates before pregnancy were found among women in their first pregnancies ($\chi^2 = 1.99, p = .01$), women with advanced education ($\chi^2 = 3.23, p = .001$), Jews ($\chi^2 = 1.61, p = .001$), and secular women ($\chi^2 = 9.89, p = .01$). Furthermore, alcohol consumption during pregnancy was relatively low among women without children ($\chi^2 = 4.76, p = .005$) and traditional Jewish women ($\chi^2 = 1.89, p < .01$).

Table 4
Reported alcohol-consumption behavior before and during pregnancy by demographic characteristic (N= 802).

| Characteristic | Response | Alcohol consumption before pregnancy (%) | χ^2 | <i>p</i> | Alcohol consumption during pregnancy (%) | χ^2 | <i>p</i> |
|-----------------|----------|--|----------|----------|--|----------|----------|
| Age (yr) | | | 7.62 | .020 | | 0.17 | .340 |
| 19–25 | Yes | 58 (10.8) | | | 17 (17.7) | | |
| | No | 47 (17.7) | | | 88 (12.5) | | |
| 26–34 | Yes | 362 (67.5) | | | 59 (61.5) | | |
| | No | 170 (63.9) | | | 473 (67.0) | | |
| 35–41 | Yes | 116 (21.6) | | | 20 (20.8) | | |
| | No | 49 (18.4) | | | 145 (20.5) | | |
| Number children | | | 1.99 | .010 | | 4.76 | .005 |
| 0 | Yes | 240 (44.8) | | | 22 (22.9) | | |
| | No | 69 (25.9) | | | 287 (40.7) | | |
| 1 | Yes | 158 (29.5) | | | 32 (33.3) | | |
| | No | 95 (35.7) | | | 221 (31.3) | | |
| 2 | Yes | 88 (16.4) | | | 23 (24.0) | | |
| | No | 53 (19.9) | | | 118 (16.7) | | |
| 3 | Yes | 35 (6.5) | | | 12 (12.5) | | |
| | No | 32 (12.0) | | | 55 (7.8) | | |
| 4+ | Yes | 15 (2.8) | | | 7 (7.3) | | |
| | No | 17 (6.4) | | | 25 (3.5) | | |
| Education | | | 3.23 | .001 | | 76.0 | .69 |
| High school | Yes | 72 (13.4) | | | 13 (13.5) | | |
| | No | 58 (21.8) | | | 117 (16.6) | | |
| Bachelor degree | Yes | 283 (52.8) | | | 51 (53.1) | | |
| | No | 144 (54.1) | | | 376 (53.3) | | |
| Master's degree | Yes | 181 (33.8) | | | 32 (33.3) | | |
| | No | 64 (24.1) | | | 213 (30.2) | | |
| Religion | | | 1.61 | .001 | | 0.79 | .150 |
| Jewish | Yes | 513 (95.7) | | | 94 (97.9) | | |
| | No | 238 (89.5) | | | 657 (93.1) | | |
| Non-Jewish | Yes | 23 (4.3) | | | 2 (2.1) | | |
| | No | 28 (10.5) | | | 49 (6.9) | | |
| Religious level | | | 9.89 | .010 | | 1.89 | <.010 |
| Secular | Yes | 319 (61.6) | | | 37 (42.5) | | |
| | No | 106 (42.2) | | | 388 (56.9) | | |
| Traditional | Yes | 87 (16.8) | | | 8 (9.2) | | |
| | No | 45 (17.9) | | | 124 (18.2) | | |
| Orthodox | Yes | 88 (17.0) | | | 29 (33.3) | | |
| | No | 62 (24.7) | | | 121 (17.7) | | |
| Ultra-Orthodox | Yes | 24 (4.6) | | | 13 (14.9) | | |
| | No | 38 (15.1) | | | 49 (7.2) | | |

Knowledge regarding alcohol consumption and its consequences

As shown in Table 5, more than one-third (39.5%) of the sample had not received any education about alcohol consumption during pregnancy; the rest had recommendations from a public or private physician (37.4%), nurse (17.2%), or social media (5.9%). Similarly, almost half (41.4%) had not received education about smoking; the rest were instructed by a physician (38.5%), nurse (16%), or social media (4.1%). Results showed that the women who consumed alcohol in the 2 mo before the pregnancy knew less about the risks ($M = 3.54$ item score, $SD = 0.52$) than did the women who had not consumed alcohol ($M = 3.71$, $SD = 0.49$), $t(800) = -4.33$, $p < .01$. Results also showed that women who smoked during the pregnancy knew less about the risks of alcohol consumption ($M = 3.33$, $SD = 0.64$) than did women who did not smoke ($M = 3.61$, $SD = 0.50$), $t(799) = -3.36$, $p < .01$.

Table 5
Education about the danger of drinking and smoking during pregnancy ($N = 802$).

| Response to the question, "Did you receive education?" | Recommendations regarding alcohol consumption during pregnancy (%) | Recommendations regarding smoking during pregnancy (%) |
|--|--|--|
| No | 317 (39.5) | 332 (41.4) |
| Yes | 485 (60.5) | 470 (58.6) |
| From private physician | 295 (36.8) | 301 (37.5) |
| From public physician | 5 (0.6) | 8 (1.0) |
| From a nurse | 138 (17.2) | 128 (16.0) |
| Self-learned from social media | 47 (5.9) | 33 (4.1) |

Associations between knowledge and demographic characteristics

Analyses of the associations between the demographic characteristics and knowledge about the risks of alcohol consumption during the pregnancy revealed a significant negative correlation between the respondents' number of children and their knowledge of the risks ($r = -.13$, $p < .01$). That is, women with more children scored lower on knowledge. There also was a difference with education level, $F(2, 799) = 4.24$, $p = .01$. Specifically, women with a high-school education ($M = 3.50$, $SD = 0.56$) knew less than did women with advanced education ($M = 3.66$, $SD = 0.48$, $p_{\text{adjust}} = .01$).

Discussion

Of the 802 pregnant Israeli women participants, 67.2% reported drinking any dose of alcohol in the 2 mo before learning they were pregnant. This high percentage aligns with worldwide findings regarding alcohol consumption that suggest women aged 18 to 29 year are more likely to drink alcohol, engage in heavy episodic drinking (four or more drinks during a drinking day), and meet criteria for an alcohol-use disorder [28]. Furthermore, in the United States, nearly 50% of young women drink alcohol and, in one study, 20% reported heavy episodic drinking in the previous 30 d [29]. These rates are worrying because the women might continue such drinking behavior while they are already pregnant but still unaware of it.

When most women become aware of their pregnancy, their consumption behavior certainly changes. We found that 86.6% of our sample reduced their alcohol consumption after conception and throughout pregnancy, which is consistent with previous studies [30, 31]. This finding may indicate that most pregnant women are aware of the harmful effects that alcohol has on the fetus.

However, the high percentage (almost 70%) who consumed alcohol during the 2 mo immediately before pregnancy must arouse great concern among policymakers. More public health awareness is needed to prevent alcohol exposure during conception and early pregnancy. Furthermore, the identification of this risk factor creates the option to implement specific actions and projects aimed at ensuring proper care and at filling knowledge gaps related to this issue. Moreover, 12% reported drinking alcohol during their current pregnancy. Sadly, this rate is close to the 14.1% that Senecky et al. reported 10 year ago in Israel [22] and to the 10% Popova et al. reported, referring to the global prevalence of alcohol use during pregnancy [4].

The estimated rate of drinking during pregnancy is even more alarming if we base the estimate on reports of "another pregnant woman drinking." As presented in the Results section, the percentage of women who claimed they personally knew women who drank alcohol during pregnancy (28.1%) was much higher than the percentage of women who acknowledged their own drinking (12.0%). This raises a question regarding the validity and reliability of self-reporting alcohol consumption before and during pregnancy. A possible explanation for this disparity might be an underreporting of alcohol consumption, as presented in Weiss et al.'s study [32]. Those authors found that among 2,477 Israeli women who gave birth in one medical center between the years 1999 and 2000, only 1.13% reported drinking any amount of alcohol, and then only in small amounts and at low frequencies during pregnancy. The researchers explained this low prevalence as underreporting due to the mothers' fear of stigmatization, denial, and/or reluctance to share this information. Whatever the reason, the important insight that emerges from these results is that the rates of maternal drinking during pregnancy might be much higher than reported.

Moreover, professional health providers should be aware that women find it difficult to report drinking alcohol during or shortly before pregnancy, be sensitive to their difficulty, and allocate alternative methods or indirect techniques to reveal alcohol use among pregnant women. This issue is becoming even more urgent due to the current reality worldwide, but more specifically in Israel, in which diagnosis of FASD remains challenging for the clinician and is often overlooked [19]. In cases for which the history of maternal alcohol consumption is unreliable or unavailable, health professionals might misdiagnose these children, incurring all clinical and social implications of that mistake [33]. As mentioned before, it is extremely important to identify mothers with a history of alcohol consumption because this will facilitate early diagnosis and possibly prevent future cases of FASD in the same family [33, 34].

Regarding the background and demographical data, our data indicate that alcohol consumption before pregnancy was greatest among Jewish women between the ages 26 and 34 year, secular women with advanced education, and those in their first pregnancy. According to data published by the Israeli Central Bureau of Statistics in 2019 [35], the average age for marriage in Israel among all women is 25 year and among Jewish women is 25.8 year. The average age of Israeli women at the time they first give birth is 27.8 year; those who give birth at a younger age are usually nonsecular. These data can explain the profile we have just described of newly married young women who continue with drinking habits characterized for young people, without knowing they are pregnant. However, alcohol consumption during pregnancy significantly correlated only with the number of children and with the religious level, such that women with four or more children and nonsecular women consumed significantly less alcohol. These results were predictable because, among traditional and Orthodox Jewish communities (who statistically have more children in the family), it is less common for women to drink alcohol [22]. Moreover, as can be seen in the results, the strongest drop in the rates of drinking after realizing that they are pregnant (from 33–4%) was found among those women who before pregnancy drank only during a Kiddush (blessing of the wine on Shabbat evening and other holy days). A final comment about demographic background regards the consumption of alcohol among Muslim women. Although the Islam religion forbids drinking alcohol, our survey showed a small percentage (0.4%) of consumption. Given the online nature of our survey, it is likely that those Muslims who reported consuming alcohol lived in a city and were relatively more educated and modern than Muslim women who live in more traditional and religious villages. In the villages, the percentage of drinking is likely much lower or even negligible.

Regarding recommendations related to alcohol consumption during pregnancy, 39.5% of the pregnant women who participated in our survey reported they had not received any recommendations. A similar percentage (41.4%) reported a lack of information regarding smoking. On one hand, these results provide some modest source of optimism when compared to the findings of 10 year ago, in which 74.9% lacked information on this topic [22]. On the other hand, a deeper look at the results reveals that of the 60% of women who had received some education, only 0.6% received it from a public-sector physician. The majority (87%) of our sample had medical follow-up during pregnancy and, based on their reports, received public-sector health services. Thus, our findings call for a much stronger education effort from public-health services, specifically those treating pregnant women, to enhance these women's level of knowledge and awareness of the risks of drinking. The dissemination of this knowledge might be especially important among women who smoke. A potentially important link between the risks for smoking and drinking during pregnancy arises from our results because we found that women who smoked during the pregnancy knew less about the risks of alcohol consumption. These results align with Senecky et al.'s findings that more smokers than nonsmokers reported drinking alcohol before and during pregnancy [22].

Several explanations could be given to the discrepancy between the estimated rate of alcohol consumption during pregnancy and the rate of FASD-diagnosed cases in Israel:

(a) The estimate of drinking rates could be inaccurate and outdated, given that there had been only one survey and it is a decade old. Moreover, the only previous survey was conducted on women after their full-term delivery (i.e., not during pregnancy), which limited the sample to pregnancies that ended successfully on term, and the reports were retrospective [22]. However, the findings of the present study replicated those of the previous survey and suggest that the rates of alcohol consumption during pregnancy remain high and have not changed much over the past 10 year.

(b) The general population, and specifically pregnant women, lacks knowledge about the dangers of alcohol consumption during pregnancy. The findings of the present study strengthen this assumption and indicate that about 40% of the pregnant women did not receive proper official information regarding the dangers of alcohol consumption and that the overall level of awareness and knowledge on this topic is low. This finding is especially worrying given the relatively high education levels among our sample participants. Completing our survey online might have created a sampling bias in this respect.

(c) Health care professionals lack knowledge, awareness, and training regarding the prevalence of maternal drinking and the diverse manifestations of FASD [23]. That is, if children are not being correctly screened and diagnosed, then the actual indices of FASD in Israel are much higher than the current rates of diagnosed children and similar to rates found in other Western countries. The few studies (discussed earlier) that have been conducted so far within an education and behavior correctional facility in central Israel and among adopted children certainly supported the possibility of a lack of knowledge and awareness about FASD among professionals in Israel and rates of FASD similar to other countries. The fact that so few health professionals who treat pregnant woman warn them about alcohol consumption provides an indirect testimony of these professionals' lack of awareness; still, further research is needed in this respect.

Overall, our findings suggest that all three explanations might co-exist and together explain the substantial gap between the data on drinking and the number of documented FASD cases in Israel.

Limitations

Despite the importance and strength of the present study's findings, several limitations should be acknowledged. First, because participation was voluntary and online, we needed to keep the questionnaire as short as possible. Therefore, we were very restricted in the number of items we could include, which prevented the possibility to separate between knowledge and awareness or to differentiate among domains of knowledge. Second, as with any survey of this type, our sample was restricted to pregnant women with access to the Internet and willingness to participate; thus, the results cannot automatically be generalized to other populations of Israeli pregnant women who do not have such access or willingness. Last, as with any survey, we had to rely on the participants' sincerity and willingness to provide truthful responses and limit possible recall bias. The question about knowing other pregnant women who drink was a successful attempt to bypass this limitation.

Conclusions

In this study, the percentages of Israeli women who consume alcohol closely before and during pregnancy are similar to the percentages reported worldwide. Most of the pregnant women who consumed alcohol were found to be Jewish women between the ages of 26 and 34 year, secular women with advanced education, and those in their first pregnancy. These results confirm previous studies indicating under-self-reporting of alcohol consumption. They emphasize the women's difficulty in admitting to having consumed alcohol during pregnancy, as well as the health professionals' lack of awareness, sensitivity, and appropriate tools to question the women about alcohol-consumption habits.

The gaps of knowledge among Israeli women strongly support the assumption of a lack of knowledge and awareness among professionals in Israel, mostly in the public sector, who treat pregnant women. This conclusion also aligns with the discrepancy between the rates of estimated alcohol consumption during pregnancy and the FASD-diagnosed cases in Israel. The results emphasize an urgent need for better education of both medical professionals and the lay public to increase awareness of the consequences of consuming alcohol during pregnancy.

List Of Abbreviations

FAS fetal alcohol syndrome

FASD fetal alcohol spectrum disorders

MIDGAM Midgam Project web panel

PAE prenatal alcohol exposure

Declarations

Ethics approval and consent to participate.

The Ethics Committee of the Faculty of Social and Health Sciences at the University of Haifa (No. 057-20) approved the study, and all participants signed online informed consent forms.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request with personal identifying information removed.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

LHH and AB served as principal investigators and senior authors; they conceptualized, designed, wrote, and reviewed the current manuscript. YS and AT reviewed the manuscript and provided scientific and clinical advice regarding the issue of FASD in Israel and regarding interpretation of the data. All authors read and approved the final manuscript.

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