Separate or Concomitant Use of Alcohol and Tobacco during Pregnancy: Prevalence and Associated Factors

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ABSTRACT

Introduction: Pregnancy is a crucial period for a child's physiological and psychological development. Alcohol and tobacco consumption during gestation is a public health concern due to the potential harm to maternal health, fetal development, and infant health. **Objective:** To identify the prevalence of separate and concomitant use of alcohol and tobacco during pregnancy and associated sociodemographic, obstetric, and clinical factors. **Method:** A quantitative cross-sectional study conducted with 253 postpartum women in a public maternity hospital in Brazil. Alcohol and tobacco use in the last trimester of pregnancy was assessed using the Alcohol Smoking and Substance Involvement Screening Test (ASSIST). Bivariate analyses and multivariate logistic regressions were performed. **Results:** The prevalence of alcohol use was 17.4%, tobacco use 7.9%, and combined use 4.7%. Alcohol use was associated with a history of abortion [Adjusted Odds Ratio (aOR) = 3.18] and higher family income. Tobacco use was associated with a higher number of children (aOR = 12.12 for four or more children). Combined use was associated with the absence of a partner (aOR = 4.11) and a previous history of depression (aOR = 3.63). **Discussion and conclusion:** The results highlight the need for implementing strategic programs for the prevention and control of alcohol and tobacco use during pregnancy, considering the identified risk factors. Raising awareness among healthcare professionals and creating targeted public policies are essential for promoting healthy pregnancy and ensuring maternal-child well-being.

Keywords: Alcohol consumption, tobacco use, pregnancy, prenatal care.

RESUMEN

Introducción: El embarazo es un período crucial para el desarrollo fisiológico y psicológico del niño. El consumo de alcohol y tabaco durante la gestación es una preocupación de salud pública debido a los posibles daños a la salud materna, al desarrollo fetal y a la salud infantil. Objetivo. Identificar la prevalencia del uso separado y concomitante de alcohol y tabaco durante la gestación y los factores sociodemográficos, obstétricos y clínicos asociados. **Objetivo:** Estudio transversal cuantitativo realizado con 253 puérperas en una maternidad pública en Brasil. El uso de alcohol y tabaco en el último trimestre del embarazo fue evaluado mediante el *Alcohol Smoking and Substance Involvement Screening Test* (ASSIST). Se realizaron análisis bivariados y regresiones logísticas multivariadas. **Método:** Estudio transversal cuantitativo realizado con 253 puérperas en una maternidad pública en Brasil. El uso de alcohol y tabaco en el último trimestre del embarazo fue evaluado mediante el Alcohol Smoking and Substance Involvement Screening Test (ASSIST). Se realizaron análisis bivariados y regresiones logísticas multivariadas. **Resultados:** La prevalencia del uso de alcohol fue del 17.4%, de tabaco del 7.9%, y del uso combinado del 4.7%. El uso de alcohol se asoció con antecedentes de aborto [Odds ratio ajustado/Razón de momios (aOR) = 3.18] y mayor ingreso familiar. El uso de tabaco se asoció con un mayor número de hijos (aOR = 12.12 para 4 o más hijos). El uso combinado se asoció con la ausencia de pareja (aOR = 4.11) y antecedentes de depresión (aOR = 3.63). **Discusión y conclusión:** Los resultados destacan la necesidad de implementar programas estratégicos para la prevención y el control del uso de alcohol y tabaco durante la gestación, considerando los factores de riesgo identificados. Es esencial la sensibilización de los profesionales de salud y la creación de políticas públicas orientadas a promover un embarazo saludable y garantizar el bienestar materno-infantil.

Palabras clave: Consumo de alcohol, uso de tabaco, embarazo, atención prenatal.

INTRODUCTION

Pregnancy is a crucial period for a child's physiological and psychological development. Maternal risk behaviors during this phase therefore have a significant impact on newborn health. Alcohol and tobacco consumption during pregnancy is a major public health concern because of its potential to harm maternal health, and fetal and embryonic development, and negatively impact child health (Scott & Sher, 2023).

Despite well-documented evidence of the teratogenic effects of alcohol and tobacco use during pregnancy, a sizable proportion of pregnant women continue to engage in these behaviors. Prevalence estimates of alcohol and tobacco use during pregnancy are broad and vary significantly by region. Globally, the prevalence of alcohol use during pregnancy is 9.8% (Popova et al., 2017), while tobacco use is 1.7%, amounting to 5.9% in the Americas (Lange et al., 2018). In Brazil, the prevalence of alcohol use during pregnancy ranges from 7.2% to 14% (Cabral et al., 2023; Dias et al., 2024; Pavesi et al., 2023). The prevalence of tobacco use during pregnancy ranges from 6.3% to 9.3% (Negrão et al., 2020; Pavesi et al., 2023). Given the significant prevalence and outcomes of the separate use of alcohol and tobacco during pregnancy, studies are required to examine the prevalence of the concomitant use of these substances and associated factors. However, studies evaluating the simultaneous use of alcohol and tobacco in pregnant women are scarce. Additionally, the available studies were conducted before the COVID-19 pandemic, which altered alcohol and tobacco use patterns in the population.

The scientific literature indicates that a complex set of factors are associated with alcohol and tobacco use during pregnancy, including mental health problems, obstetric variables, and sociodemographic and environmental characteristics (Dias et al., 2024; Kar et al., 2021). The analysis of socioeconomic contexts and access to health and obstetric services associated with substance use during pregnancy is essential given that this behavior constitutes a significant social problem. A study based on the analysis of medical records showed that factors such as inequality were associated with multiparous women and an insufficient number of prenatal consultations. In addition, smoking was correlated with lower education levels (Crisóstomo et al., 2022). Although some associations have been well established, other require further investigation. Research is needed to examine the factors linked to both individual and combined use of alcohol and tobacco during pregnancy, as this area remains insufficiently understood within scientific literature.

This study aimed to determine the prevalence of the separate and concomitant use of alcohol and tobacco during pregnancy and the associated sociodemographic, obstetric, and clinical factors.

METHOD

Study design

This is a cross-sectional, inferential study with a quantitative approach, based on the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol.

Participants

The research was conducted at a public maternity hospital in the municipality of Rio Verde, in the southwest micro-region of the state of Goiás, in the west central region of Brazil. Participants were recruited using convenience sampling between February and April 2022. Postpartum women aged ≥ 18 years, whose pregnancies resulted in live births at the time of sample recruitment, conducted shortly after delivery and before hospital discharge, were included.

Because this was a study with convenience sampling from a finite population, a sample power calculation was performed. The sample power calculation for a bivariate logistic regression with 253 participants, a significance level of .05, an odds ratio of 1.5, and an event proportion of .3, yielded a sample power of approximately .864 (86.4%).

Measurement

The separate and combined use of alcohol and tobacco were evaluated as dependent variables in the present study. Substance use was assessed using the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST), validated for the Brazilian context (Henrique et al., 2004). Specific modules for alcohol and tobacco were used, and the defining question for use was "In the past three months, how often have you used the mentioned substance(s)?" Guidelines recommend that pregnant women abstain from consuming any alcohol or tobacco, as these are teratogenic substances and there is no consensus on safe consumption levels. Accordingly, responses other than "never" were categorized as substance use during pregnancy (Carson et al., 2010; World Health Organization [WHO], 2014; 2021).

The independent variables analyzed assessed the sociodemographic, obstetric, and clinical characteristics of participants. The questions covered age, skin color, educational attainment, marital status, family income, employment status, prenatal care, history of abortion, number of pregnancies, pregnancy complications, type of delivery, and start of prenatal care. Obstetric variables were evaluated by identifying the start and completion of prenatal care, number of pregnancies, pregnancy complications, type of delivery, number of live births, and

history of previous abortion. The primary clinical variable assessed was the self-reported history of depression diagnosis, determined by asking participants whether they had ever received a diagnosis of depression from a healthcare professional.

Procedure

Postpartum women were recruited before hospital discharge, during which time the research objectives were presented. Those who agreed to participate received a link to access the questionnaire through their cell phones. Data were collected between the second and fifth days postpartum, following the recommendations of the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).

Statistical analyses

Data analyses were performed using the Statistical Package for the Social Sciences version 29. Chi-square or Fisher's exact tests were used to determine the association between the independent variables and substance use in bivariate analyses.

A multivariate logistic regression analysis was performed to assess the influence of independent variables on alcohol and tobacco use during pregnancy. Age was added to the regression models to control for confounding factors. Other variables included in the regression models were selected after significant association analysis in the bivariate analyses. The entry method was used to include independent variables in the models. The assumptions of multivariate logistic regression were verified using the Variance Inflation Factor (VIF) and Tolerance tests. Test results were acceptable, with VIF coefficients below 1.05 and tolerance below .98.

Ethical considerations

This study was conducted in accordance with the guidelines of the Declaration of Helsinki, particularly regarding informed consent. Additionally, ethical precepts established by Resolution 466/2012 of the Brazilian National Health Council were followed. All participants signed an Informed Consent Form (ICF) before beginning the study. The study was approved by the Research Ethics Committee (opinion number: 4.380.084).

RESULTS

The sample for this study included 253 postpartum women, mainly within the age range of 22 to 29 years (48.2%), and with brown skin (83%). The majority of participants were partnered (88.9%) and living with their partners (88.9%).

Table 1

Sociodemographic, obstetric, and clinical characteristics of postpartum women

Variable	N	%
Age		
≤ 21 years	66	26.1
22 – 29 years	122	48.2
≥ 30 years	65	25.7
Skin color		
White	43	17.0
Black	18	7.1
Brown	183	72.3
Other	9	3.6
Marital status		
Partnered	225	88.9
Unpartnered	28	11.1
Co-habiting with partner		
Yes	207	81.8
No	46	18.2
Education level		
No formal education	17	6.7
Primary/elementary	41	16.2
Secondary/high school	142	56.1
Higher education or above	53	20.9
Employment status		
Not engaged in paid employment	141	55.7
Engaged in paid employment	112	44.3
Family income*		
< 1 minimum wage	109	43.1
1-2 minimum wages	122	48.2
≥ 3 minimum wages	22	8.7
Prenatal care		
Yes	250	98.8
No	3	1.2
Start of prenatal care		
1st trimester	188	74.3
2nd trimester	40	15.8
3rd trimester	22	22
No prenatal care	3	1.2
Number of pregnancies		
Primiparous	177	70.0
Multiparous	76	30.0
Type of delivery		
Vaginal	100	39.5
Cesarean	153	60.5
Number of children		
1 child	108	42.7
2-3 children	119	47.0
4 or more	26	10.3
History of induced abortion		
Yes	34	13.4
No	219	86.6
Previous history of depression		
Yes	91	36.0
No	162	64.0

Note: n = sample size, * Minimum wage in Brazil in 2022 = R$ 1,212.00.

Regarding education, 56.1% had completed high school, 55.7% were unemployed, and 48.2% had a family income of between one and two minimum wages. Most patients had received prenatal care (98.8%) from the first trimester of pregnancy (74.3%). Most postpartum women were primiparous (70%) and did not experience complications during pregnancy (79.1%). Regarding the type of delivery, 60.5% had a cesarean section and 47% had two or three children.

Table 2

Relationship between alcohol and/or tobacco use and sociodemographic, obstetric, and clinical characteristics of postpartum women

Variable	Alcohol n (%)	p*	Tobacco n (%)	p*	Alcohol and tobacco	p*
Total participants	44 (17.4)		20 (7.9)		12 (4.7)	
Age		.596		.782		.694
≤ 21 years	11 (25)		5 (25)		4 (33.3)	
22 – 29 years	24 (54.5)		11 (55)		6 (50)	
≥ 30 years	9 (20.5)		4 (20)		2 (16.7)	
Skin color		.524		.428		.544
White	6 (13.6)		2 (10)		2 (16.7)	
Black	5 (11.4)		3 (15)		2 (16,7)	
Brown	31 (70.5)		15 (75)		8 (66,7)	
Other	2 (4.5)		0 (0)		0 (0)	
Marital status		.113		.055		.032
Partnered	36 (81.8)		15 (75)		8 (66.7)	
Unpartnered	8 (18.2)		5 (25)		4 (33.3)	
Co-habiting with partner		.085		.221		.239
Yes	32 (72.7)		14 (70)		8 (66.7)	
No	12 (27.3)		6 (30)		4 (33.3)	
Education level		.677		.317		1
No formal education	2 (4.5)		2 (10)		0 (0)	
Primary/Elementaryelementa	9 (20.5)		5 (25)		4 (33.3)	
Secondary/high school	26 (59.1)		8 (40)		5 (41.7)	
Higher education or above	7 (15.9)		5 (25)		3 (25)	
Employment status		.611		.314		.315
Not engaged in paid employment	23 (52.3)		9 (45)		5 (41.7)	
Engaged in paid employment	21 (47.7)		11 (55)		7 (58.3)	
Family income*		.012		1		.906
< 1 minimum wage	22 (50)		9 (45)		6 (50)	
1-2 minimum wages	14 (31.8)		10 (50)		5 (41.7)	
≥ 3 minimum wages	8 (18.2)		1 (5)		1 (8.3)	
Prenatal care		.438		.220		1
Yes	43 (97.7)		19 (95)		12 (100)	
No	1 (2.3)		1 (5)		0 (0)	
Start of prenatal care		.618		.178		.581
1st trimester	32 (72.7)		13 (65)		9 (75)	
2nd trimester	6 (13.6)		5 (25)		3 (25)	
3rd trimester	5 (11.4)		1 (5)		0 (0)	
No prenatal care	1 (2.3)		1 (5)		0 (0)	
Number of pregnancies		.519		.311		.756
Primiparous	29 (65.9)		12 (60)		8 (66.7)	
Multiparous	15 (34.1)		8 (40)		4 (33.3)	
Pregnancy complications		.366		1		.469
Yes	7 (15.9)		4 (20)		1 (8.3)	
No	37 (84.1)		16 (80)		11 (91.7)	
Type of delivery		.585		.666		.374
Vaginal	19 (43.2)		7 (35)		3 (25)	
Cesarean	25 (56.8)		13 (65)		9 (75)	
Number of children		.094		.022		.245
1 child	13 (29.5)		7 (35)		4 (33.3)	
2-3 children	24 (54.5)		7 (35)		5 (41.7)	
4 or more	7 (15.9)		6 (30)		3 (25)	
History of induced abortion		.013		.322		.061
Yes	11 (25)		4 (20)		4 (33.3)	
No	33 (75)		16 (80)		8 (66.7)	
Previous history of depression		.149		.065		.031
Yes	20 (45.5)		11 (55)		8 (66.7)	
No	24 (54.5)		9 (45)		4 (33.3)	

Note: *n* = sample size; * *p*-value from chi-square association analyses; † Minimum wage in Brazil in 2022 = R$ 1,212.00.

Regarding abortions, 13.4% reported a previous abortion, while 36% reported a depression diagnosis (Table 1).

The results showed a prevalence of alcohol use of 17.4% (95% CI 13 - 22.1), tobacco use of 7.9% (95% CI 4.7 - 11.5), and combined alcohol and tobacco use of 4.7% (95% CI 2.4 - 7.5) during pregnancy. Table 2 presents the chi-square association analyses regarding the use of these substances with the sociodemographic, obstetric, and clinical variables of the postpartum women. An association was found between alcohol use and family income ($p = .012$) and previous abortions ($p = .013$). There was an association between tobacco use and number of children ($p = .022$). Combined use of these substances was linked to marital status ($p = .032$) and prior depression history ($p = .031$) (Table 2).

In the multivariate analyses, alcohol use was significantly associated with a history of induced abortion after controlling for age. Women who reported a previous abortion were 3.18 times as likely to use alcohol during pregnancy (Adjusted Odds Ratio [aOR] = 3.18; 95% CI: 1.35 - 7.49; $p = .008$). Regarding family income, those with an income below one minimum wage (aOR = .35; 95% CI: .12 - .99; p = .050) or between one and two minimum wages (aOR = .19; 95% CI: .06 - .54; $p = .002$) had a lower probability of alcohol use than women with a family income of three minimum wages or more. Tobacco use was significantly associated with a woman's parity. Women who had four or more children were 12.12 times as likely to use tobacco than women with one child (aOR = 12.12; 95% CI: 2.44 - 60.07; $p = .002$). Unpartnered women were 4.11 times as likely to use both substances (aOR = 4.11; 95% CI: 1.09 - 15.46; $p = .036$). Moreover, those with a history of depression were 3.63 times as likely to combine alcohol and tobacco use (aOR = 3.63; 95% CI: 1.04 - 12.68; $p = .043$) (Table 3).

Table 3
Multivariate logistic regression analyses of variables associated with alcohol and/or tobacco use during pregnancy

Variable	aOR (IC95%)*	p
Alcohol use		
Age	.98 (.92 – 1.04)	.600
History of abortion	3.18 (1.35 – 7.49)	.008
Family income		
Less than one minimum wage	.35 (.12 – .99)	.050
One to two minimum wages	.19 (.06 – .54)	.002
Tobacco use		
Age	.88 (.79 – .99)	.998
Number of children		
Two to three children	1.30 (.41 – 4.08)	.643
Four or more children	12.12 (2.44 – 60.07)	.002
Alcohol and Tobacco Use		
Age	.95 (.84 – 1.08)	.486
Without partner	4.11 (1.09 – 15.46)	.036
History of depression	3.63 (1.04 – 12.68)	.043

Note: * Adjusted odds ratio and 95% confidence interval adjusted for age.

DISCUSSION AND CONCLUSIONS

In the present study, the prevalence of alcohol, tobacco, and combined alcohol and tobacco use during pregnancy was 17.4%, 7.9%, and 4.7%, respectively. The results also demonstrated associations between alcohol use and a history of induced abortion and family income, tobacco use and number of children, and combined alcohol and tobacco use and marital status and history of depression.

Studies have shown that the prevalence of alcohol and tobacco use during pregnancy varies according to the context in which the woman is admitted, the data collection method, and the instruments used. A study conducted in southern Brazil among low-risk pregnant women, utilizing the same assessment instrument as the current research and employing face-to-face interviews at Family Health Units, reported a prevalence of 14% for alcohol consumption and 28.5% for tobacco use (Dias et al., 2024). In the state of Santa Catarina, a study conducted of postpartum women found a prevalence of 7.2% for alcohol use and 9.3% for tobacco use (Pavesi et al., 2023). The prevalence of alcohol use in the present study (17.4%) was higher than that found in previous studies (14% and 7.2%) and lower (7.9%) in regard to tobacco use (28.5% and 9.3%). The combined use of alcohol and tobacco has not been widely explored in recent publications. However, a study conducted between 2011 and 2012 observed a prevalence of 2.2% among pregnant women (Cabral et al., 2023). This value is lower than that found in the present study, which recorded a prevalence of 4.7% among the postpartum women evaluated.

The discrepancies among study estimates should be interpreted cautiously, due to the inconsistent terminology utilized for alcohol and tobacco use during pregnancy, as well as the absence of standardized recommendations for assessment instruments (Cabral et al., 2023; Chagas et al., 2021). However, it is worth noting that most studies define substance use as any amount of consumption reported during pregnancy (Cabral et al., 2023; Dias et al., 2024; Pavesi et al., 2023). Furthermore, the guidelines for monitoring pregnant women, established by health agencies, recommend abstaining from alcohol and tobacco use during pregnancy, given the adverse consequences of use, even in small quantities (Ministério da Saúde, 2022; WHO, 2013).

Alcohol and tobacco use during pregnancy is associated with individual/subjective issues, sociocultural and environmental contexts, and a lack of information on the adverse consequences and the absence of technical approaches to the subject during prenatal care (Martinelli et al., 2021). Health professionals should implement effective strategies for screening for alcohol and tobacco use during pregnancy, considering modifiable factors that can be addressed by the health system, as recommended by the WHO (2014). Screening should be performed to ensure the timely identification of substance use and to increase pregnant women's

access to specialized mental health services, preferably with valid instruments such as the WHO ASSIST (Henrique et al., 2004).

It is important to note that, in this study, the assessment of alcohol and/or tobacco use specifically referred to the last trimester of pregnancy and that the timing of exposure to these substances can be influenced by a range of factors. Studies indicate that alcohol and tobacco consumption tends to decrease as pregnancy progresses, and is more prevalent in the first trimester (Tigka et al., 2023; Pereira et al., 2022). This reduction throughout pregnancy may be associated with increased awareness among women regarding the potentially negative consequences of using these substances for fetal development. It is therefore essential for preventive and educational actions to be implemented at the beginning of prenatal care, with the goal of early screening and intervention to help maintain reduced alcohol and tobacco use throughout pregnancy.

After pregnant women have screened positive for alcohol and/or tobacco use during pregnancy, health professionals should conduct brief interventions, to encourage them to continue to abstain from using these substances (Minozzi et al., 2024). Health professionals should implement a brief intervention strategy using evidence-based health education, to inform pregnant women of the adverse consequences of alcohol and tobacco use for the mother-child dyad. This intervention should be delivered with warmth and empathy to establish a bond with the pregnant women and reduce the stigma they face (Chang, 2020).

The present study promotes the identification and understanding of the factors entailing a higher risk of alcohol and tobacco use, to contribute to decision-making in actions designed to prevent the use of these substances during pregnancy. Alcohol consumption was associated with a history of previous abortion and family income.

As in the present study, research conducted in Ethiopia identified a 4.07-fold increase in the likelihood of alcohol use among women with a previous abortion (Bete et al., 2023). The relationship between a history of induced abortion and alcohol use during pregnancy can be explained by the fact that women who have experienced this situation may have high levels of stress and anxiety. They may resort to alcohol use as a coping strategy (Koly et al., 2023). It is therefore necessary to use practices designed to minimize the impact of this situation through low-density actions for primary health care. These include mindfulness practices, which have yielded satisfactory results as a coping strategy for mental health problems (Gherardi-Donato et al., 2023).

In the present study, women with a higher family income were at a higher risk of alcohol use. A study conducted with pregnant women in Japan showed that a higher family income was associated with an increased risk of alcohol use during early pregnancy, but not during mid-pregnancy (Murakami et al., 2020). In contrast to the results of the present study, research conducted in Brazil reported higher alcohol consumption among pregnant women with lower socioeconomic status (Cabral et al., 2023). Further studies should be conducted to evaluate the influence of income as a social determinant of alcohol consumption among pregnant women.

Research participants with more children were more likely to use tobacco during pregnancy. This association may stem from underestimating the risks of tobacco use during later pregnancies, particularly when prenatal counseling is lacking and pre-pregnancy tobacco habits persist (Odendaal et al. 2020).

Furthermore, postpartum women who were unpartnered or had a history of depression had a higher likelihood of combined alcohol and tobacco use during pregnancy. These results are in line with a previously published study by Bete et al., 2023. The authors suggest that the lack of social support, often obtained through an affective relationship, could explain the association between being unpartnered and combining alcohol and tobacco use. Finally, the association found between previous depression and substance use in the present study is corroborated by recent research findings that substance use may increase during pregnancy among women with a history of depression (Chapman et al., 2024).

Routine screening for alcohol and tobacco risk factors should be part of prenatal care, especially by nursing staff in primary health units. Professionals should be trained to provide psychosocial interventions and, if necessary, refer pregnant women to the Psychosocial Care Network to access specialized mental health services such as the Psychosocial Care Center for Alcohol and Drugs.

Identifying pregnant women who are more likely to use alcohol and/or tobacco during pregnancy is crucial to guiding interventions. However, the results of this study have certain limitations. Key variables for identifying factors associated with substance use, such as pregnancy planning and a history of induced abortion, were not evaluated. Online data collection may introduce sampling bias, as it may fail to capture the experiences of individuals without internet access or digital devices. Moreover, self-reported alcohol and tobacco use during pregnancy may be underestimated because of social desirability bias and stigma. In this study, we used confidential online assessments to minimize social desirability bias and obtain accurate responses from participants.

Alcohol and tobacco use during pregnancy is a public health issue requiring urgent attention from the health system. Research indicates that factors such as a history of induced abortion, family income, number of children, marital status, and prior experiences with depression each uniquely affect the likelihood of substance use during pregnancy.

Given the substantial impact of these substances on maternal and fetal health, it is essential to implement

strategic, comprehensive programs designed to structure effective measures for the control and prevention of alcohol and tobacco consumption during the gestational period. Raising awareness among health professionals and creating targeted public policies are crucial steps towards promoting healthy pregnancies and ensuring the well-being of both mothers and babies.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

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