

ORIGINAL

Influence of educational level on the prevalence of risk behaviors during the perinatal period

Influencia del nivel de estudios en la prevalencia de conductas de riesgo durante el periodo perinatal

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Abstract

The objective of this work was to assess changes during pregnancy and after childbirth in diet, consumption of tobacco, electronic cigarettes, cannabis, alcohol use and exposure to environmental tobacco smoke depending on the mother's educational level.

A cross-sectional study was carried out whose target population was 18,822 Galician women aged 18-49 who gave birth between September 2015 and August 2016, and their 19,204 live-born children. A descriptive analysis was performed, and the prevalence of different behaviors was estimated at three time points – pre-pregnancy, pregnancy and after childbirth – depending on the mother's educational level. Percentages of change were calculated. Information was obtained from 6,436 women. Regardless of the educational level, during pregnancy there was an improvement in the different lifestyles. In the first months after childbirth, lifestyles worsened, except for exposure to environmental tobacco smoke and the use of electronic cigarettes. Most of the risk behaviors showed a gradient depending on the educational level; thus, the lower the educational level, the higher the prevalence of risk behaviors.

In general, during pregnancy all women adopted healthier lifestyles that they abandoned in the months following childbirth. Women with a lower level of education showed a higher prevalence of risk behaviors, both in the period prior to pregnancy, as well as during pregnancy and after childbirth.

Keywords: lifestyle, behavior, pregnancy, mothers, education primary and secondary, education higher, tobacco, feeding

Resumen

El objetivo de este trabajo fue valorar cambios durante el embarazo y tras el parto en la dieta, consumo de tabaco, cigarrillos electrónicos, alcohol, cannabis y exposición al humo ambiental de tabaco en función del nivel de estudios de la madre. Para ello, se llevó a cabo un estudio transversal cuya población objetivo fueron 18.822 mujeres gallegas de 18-49 años que dieron a luz entre septiembre 2015 y agosto 2016, y sus 19.204 hijos/as nacidos vivos. Se realizó un análisis descriptivo y se estimó la prevalencia de diferentes conductas en tres momentos temporales —pre-embarazo, embarazo y tras el parto— en función del nivel de estudios de la madre. Se calcularon los porcentajes de cambio.

Se obtuvo información de 6.436 mujeres. Con independencia del nivel de estudios, durante el embarazo se produce una mejora en los diferentes estilos de vida. En los primeros meses tras el parto los estilos de vida empeoran, con excepción de la exposición al humo ambiental de tabaco y el consumo de cigarrillos electrónicos. La mayoría de las conductas de riesgo muestran un gradiente dependiente del nivel educativo; así, a menor nivel educativo, mayor es la prevalencia de conductas de riesgo.

En general, durante el embarazo todas las mujeres adoptan estilos de vida más saludables que abandonan en los meses siguientes al parto. Las mujeres con menor nivel de estudios muestran una mayor prevalencia de conductas de riesgo, tanto en el periodo previo al embarazo, como en el embarazo y tras el parto.

Palabras clave: estilo de vida, conducta, embarazo, madres, educación primaria y secundaria, educación superior, tabaco, alimentación

■ Received: October 2022; Accepted: April 2023.

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

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From preconception until after childbirth, the maternal lifestyle, including substance use, can have a significant impact on foetal development and the future health of children. In Spain, there is a lack of information that would permit us to establish the prevalence of risk behaviours in pregnant women. A meta-analysis of ten primary studies carried out in 2018 estimates the prevalence of tobacco smoking at 26.0% (Lange et al., 2018). The prevalence of alcohol and cannabis use during pregnancy in Spain may be estimated at 25.0%-27.2% for alcohol and 2.4-5.0% for cannabis (Blasco-Alonso et al., 2015; Ortega-García et al., 2012).

Pregnancy represents a “teachable moment” for adopting a healthy lifestyle, including quitting substance use, since women at this life stage are more receptive to change (Olander et al., 2016). On the other hand, lifestyles are closely related to each other and to educational level, with objective health indicators improving as the level of education increases (Borrell et al., 2004). Assessing whether educational level influences changes in risk behaviours during pregnancy and after childbirth is important since if such influence exists, context-specific interventions based on educational level should be developed to avoid health inequalities. Among the potentially modifiable risk behaviours affecting foetal development are unhealthy diet, eating fish rich in methylmercury due to the harmful effects of methylmercury on the physical and neurological development of infants (Saavedra et al., 2022), using drugs such as tobacco, alcohol or cannabis, smoking e-cigarettes (Bar-Zeev, 2022; González Sala et al., 2020; Gould et al., 2020; Popova et al., 2021) and exposure to environmental carcinogens, such as second-hand tobacco smoke (Banderali et al., 2015).

To date, there are few studies estimating the prevalence and identifying the changes in risk behaviours associated with women's lifestyles in the three key periods (pre-pregnancy, pregnancy and postnatal) as linked to educational level, and none have been carried out in the Spanish population. The aim of this study was therefore to assess the existence of differences in the prevalence of various lifestyle factors based on educational level among Galician women who had children in 2016 in the preconception period, during pregnancy and in the months after giving birth.

Method

Data source and sample size

Within the framework of the Galician risk behaviour information system (Sistema de Información sobre Conductas de Riesgo de Galicia, SICRI), a cross-sectional study was carried out in 2016 with a target population of 18,822 women aged 18 years and over, resident in Galicia, who gave birth between September 1, 2015 and August 31, 2016, and their 19,204 live-born children in that period.

The registry of the detection of neonatal endocrine and metabolic diseases program (Programa de Detección Precoz de Enfermedades Endocrinas y Metabólicas durante el período Neonatal) was used to select a sample of these women, from now on referred to as mothers. Sampling was random, stratified by age groups (18-24, 25-29, 30-34, 35-39 and 40 years or older) and, in a second stage, one child was selected for each mother in case of multiple births. The sample size of women was calculated independently for each age stratum, with an expected prevalence of 50% and a sampling error of less than 2%. The theoretical sample size was 6,777 mothers and their live-born children.

Data collection

Computer-assisted telephone interviews (CATI) were carried out with the selected mothers, with questions regarding the preconception period (6 months prior to pregnancy), pregnancy and postpartum (referring to the time of the survey, which was 3 to 16 months after birth). The instrument used for data collection was a questionnaire developed specifically for the study and subsequently validated in a sample of the target population. Specific information about the design and the questionnaire can be found at: www.sergas.es/Saude-publica/SICRI-2016.

Variables

Sociodemographic variables included age, country of birth, degree of urbanization, level of education, living situation, employment situation and parity. The variables analyzed before, during and after birth were: non-compliance with dietary recommendations, eating fish rich in methylmercury (swordfish/bluefin tuna), use of tobacco, e-cigarettes, alcohol, cannabis and exposure to environmental tobacco smoke (ETS). The questions were the same at the three time points, the only difference being the period to which they referred.

Mothers who reported not eating fruit or vegetables daily or two or more servings of fish per week were considered as not following a healthy diet. They were considered to be eating fish rich in methylmercury if they reported the consumption of swordfish/bluefin tuna at least once a week. Women who reported using tobacco, electronic cigarettes, alcohol and cannabis and being exposed to ETS were considered as such, regardless of frequency and intensity.

To assess education, they were asked about the highest educational level achieved; this was then categorized into basic (no studies, incomplete or completed primary schooling), intermediate (incomplete or completed secondary education and vocational training) and higher (incomplete or completed university studies).

Women with a healthy lifestyle were defined as those who followed a healthy diet, did not consume methylmercury-rich fish, did not smoke tobacco, cigarettes, e-cigarettes or

cannabis, did not drink alcohol and were not exposed to ETS.

Statistical analysis

A descriptive analysis was performed and the prevalence of risk behaviours were estimated with 95% confidence intervals (CI). Percentages of change were calculated for each variable analyzed.

Statistical analysis was carried out using Stata v.16.

Ethical aspects

As the study was telephone-based, voluntary, with guaranteed confidentiality, and as the agreement to participate implied the women's consent, authorization from an ethics committee was not required.

Results

Information was obtained from 6,436 mothers aged between 18 and 49 years. Median interview duration was 25 minutes. Those under 30 years old made up 21.3% of the sample (95% CI: 21.1%-21.5%), and 9.9% (9.8%-10.0%) were over 40. Regarding educational level, 18.8% (17.8%-19.7%) had basic schooling, 37.1% (35.9%-38.3%) had intermediate studies and 44.1% (42.9%-45.4%) had higher education (Table 1).

A healthy lifestyle was most prevalent among mothers with higher education and fell with decreasing education levels. These results are observed in all three periods, i.e., preconception, during pregnancy and after delivery (Figure 1).

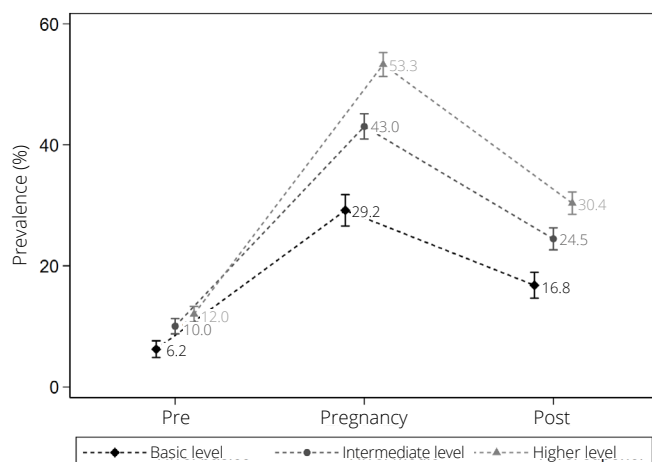
Table 1

Characteristics of Galician women aged 18 to 49 in the six months before pregnancy

Sociodemographic variables	%	CI95%
Age group		
18-29	21.3	21.1 - 21.5
30-34	34.1	33.9 - 34.3
35-39	34.7	34.5 - 34.9
40 +	9.9	9.8 - 10.0
Country of birth		
Spain	89.1	88.3 - 89.9
Other country	10.9	10.1 - 11.7
Degree of urbanization		
Urban	71.0	69.9 - 72.1
Semi-urban	19.5	18.6 - 20.4
Rural	9.6	8.8 - 10.3
Educational level		
Basic	18.8	17.8 - 19.7
Intermediate	37.1	35.9 - 38.3
Higher	44.1	42.9 - 45.4
Living situation		
With partner	94.7	94.2 - 95.3
Single	5.3	4.7 - 5.9
Work situation		
In work	71.7	70.6 - 72.9
Unemployed	18.6	17.6 - 19.6
Inactive	9.7	9.0 - 10.4
First-time mothers	57.0	55.8 - 58.3
Self-perceived health status		
Very good	25.1	24.0 - 26.2
Good	47.6	46.3 - 48.9
Normal	25.2	24.1 - 26.3
Bad – very bad	2.1	1.7 - 2.5

Figure 1

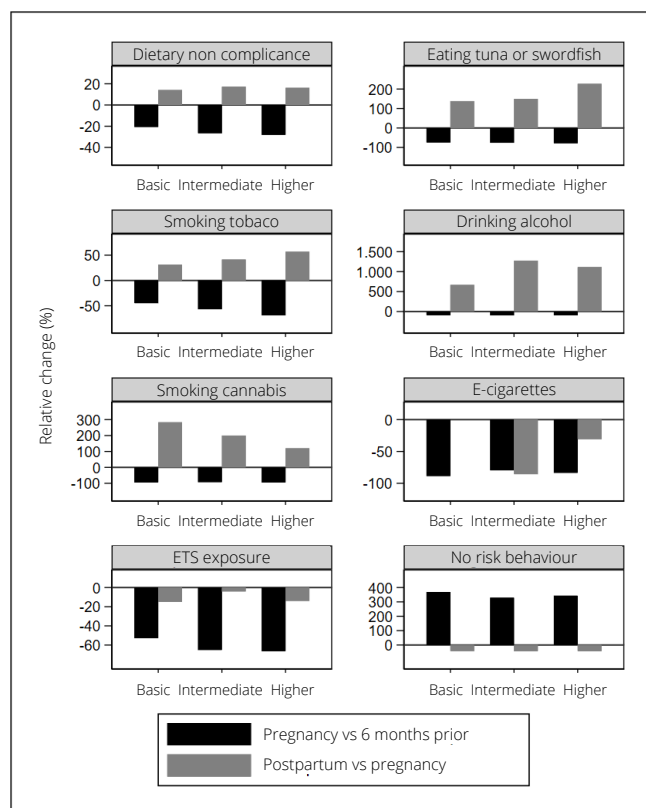
Prevalence of women with healthy lifestyles by educational level and at the three moments assessed: before pregnancy (pre), during pregnancy (pregnancy) and after childbirth (post)*



Note. *A healthy lifestyle is defined as complying with dietary recommendations, not consuming fish rich in methylmercury, not smoking tobacco, cannabis or e-cigarettes, not drinking alcohol and not being exposed to environmental tobacco smoke.

Figure 2

Relative change in maternal behaviours by educational level. Pregnancy versus pre-pregnancy (6 months before pregnancy) and postpartum (3-16 months after birth) versus pregnancy



Before pregnancy, the most common risk behaviour was the lack of a healthy diet, with 55.0% (53.7%-56.3%) of women in this category. As can be seen in Figure 2, which shows the relative change in behaviours by educational level in the three periods analyzed, all behaviours improved during pregnancy and worsened or stabilized after childbirth. Compared to before pregnancy, tobacco smoking decreased by 57%, but the decrease was stronger among mothers with higher education (Figure 2 and Annex 1).

Before pregnancy, during pregnancy and postpartum, risk behaviours were more prevalent among mothers with a lower educational level, with the exception of alcohol, cannabis and e-cigarette use. Tobacco use and ETS exposure decreased with higher educational. Mothers with a basic educational level compared to secondary and higher levels had a higher prevalence of tobacco smoking before pregnancy (30% and 60% more respectively), during pregnancy (46% and 79% more) and after childbirth (41% and 73% more). Likewise, with respect to secondary and higher levels, women with basic schooling were more exposed to ETS before pregnancy (20% and 44% more), during pregnancy (41% and 60% more) and after childbirth (33% and 60% more). Women with a higher level of education had a higher prevalence of drinking alcohol in all three periods. The prevalence of cannabis and e-cigarette use, as well as ETS exposure, was not significantly different postpartum compared to during pregnancy at any of the three educational levels (Table 2 and Annex 1).

Table 2
Maternal behaviours before pregnancy, during pregnancy and postpartum by level of education

		Basic level (95% CI)	Intermediate level (95% CI)	Higher level (95% CI)
Failing to comply with dietary recommendations	Pre-pregnancy	69.2 (66.5-71.8)	58.6 (56.5-60.7)	45.9 (43.9-47.9)
	During pregnancy	54.8 (52.0-57.6)	43.0 (40.9-45.1)	33.0 (31.1-34.9)
	Postpartum	62.6 (59.8-65.4)	50.5 (48.3-52.6)	38.4 (36.4-40.3)
Eating fish containing methylmercury	Pre-pregnancy	25.7 (23.2-28.2)	27.8 (25.9-29.7)	32.5 (30.6-34.3)
	During pregnancy	6.6 (5.2-8.0)	6.7 (5.6-7.7)	7.0 (5.9-8.0)
	Postpartum	15.7 (13.5-17.7)	16.6 (15.0-18.2)	22.8 (21.1-24.5)
Smoking tobacco (daily or occasional smoker)	Pre-pregnancy	42.4 (39.6-45.2)	30.8 (28.8-32.7)	19.2 (17.7-20.8)
	During pregnancy	23.4 (21.0-25.8)	13.3 (11.8-14.7)	6.0 (5.0-7.0)
	Postpartum	30.7 (28.1-33.3)	18.8 (17.1-20.4)	9.4 (8.2-10.5)
Smoking e-cigarettes	Pre-pregnancy	1.6 (0.9-2.2)	1.0 (0.6-1.4)	0.8 (0.4-1.1)
	During pregnancy	0.2 (0.0-0.4)	0.2 (0.0-0.4)	0.1 (0.01-0.3)
	Postpartum	0.2 (0.0-0.4)*	0.0 (0.0-0.1)*	0.1 (0.0-0.2)*
Drinking alcohol	Pre-pregnancy	45.1 (42.3-47.8)	50.3 (48.2-52.4)	60.8 (58.8-62.7)
	During pregnancy	3.5 (2.4-4.6)	2.1 (1.5-2.7)	2.8 (2.1-3.5)
	Postpartum	27.1 (24.6-29.7)	28.6 (26.7-30.5)	34.0 (32.1-36.0)
Smoking cannabis	Pre-pregnancy	2.3 (1.5-3.1)	1.4 (0.9-1.9)	1.0 (0.6-1.4)
	During pregnancy	0.1 (0.0-0.3)	0.1 (0.0-0.2)	0.0 (0.0-0.2)
	Postpartum	0.5 (0.1-0.8)*	0.3 (0.1-0.5)*	0.1 (0.0-0.2) *
ETS exposure	Pre-pregnancy	36.6 (33.9-39.2)	29.3 (27.4-31.2)	20.5 (18.9-22.1)
	During pregnancy	17.2 (15.1-19.3)	10.2 (9.0-11.5)	6.9 (5.8-7.9)
	Postpartum	14.7 (12.7-16.6)	9.8 (8.6-11.0)*	5.9 (5.0-6.9)*
Healthy lifestyle**	Pre-pregnancy	6.2 (4.8-7.6)	10.2 (8.8-11.3)	12.0 (10.7-13.3)
	During pregnancy	29.2 (26.6-31.8)	43.0 (40.9-45.1)	53.3 (51.3-55.3)
	Postpartum	16.8 (14.6-18.9)	24.5 (22.6-26.3)	30.4 (28.5-32.2)

Note. * Changes in prevalence with respect to the previous time period are not statistically significant. **A healthy lifestyle is defined as complying with dietary recommendations, not consuming fish rich in methylmercury, not smoking tobacco, cannabis or e-cigarettes, not drinking alcohol and not being exposed to environmental tobacco smoke.

Discussion

The prevalence of health-risk behaviours in the period before pregnancy, during pregnancy and postpartum varied by educational level. Thus, the prevalence of most risk behaviours increased with decreasing level of education. Irrespective of education, all behaviours explored improved during pregnancy: compliance with dietary recommendations increased and the consumption of methylmercury-rich fish, tobacco, e-cigarettes, alcohol, cannabis, as well as ETS exposure all decreased. After childbirth, all behaviours worsened except ETS exposure and e-cigarette use, which was lower than during pregnancy.

Overall, dietary recommendations were not heeded, in line with what is observed in other countries both in relation to dietary recommendations (Jarman et al., 2017) and the consumption of fish rich in methylmercury (Branco et al.,

2021). In Spain, although it is recommended that large fish should not be eaten during pregnancy, only 50% of pregnant women declared that a health professional had informed them to avoid eating swordfish or tuna (Mourino et al., 2022).

Regarding tobacco, alcohol and cannabis use and ETS exposure during pregnancy, the obstetric and foetal complications have been perfectly well established. These include ectopic pregnancy, spontaneous abortion, placental abruption or preterm birth, intrauterine growth restriction, intrauterine death or sudden infant death (González Sala et al., 2020; Gould et al., 2020; Popova et al., 2021). Prolonged exposure of the foetus to alcohol can cause a combination of physical and behavioural problems with long-term repercussions known as foetal alcohol spectrum disorder (Lee & Mostafaie, 2020). Regarding e-cigarette smoking, although they are associated with lower risks compared to

standard cigarettes, the specific effects they might have during pregnancy have not yet been established (Bar-Zeev, 2022).

In our study, the decrease in alcohol use linked to pregnancy stands out, being much more pronounced than that of tobacco smoking. Although it would be ideal to obtain zero consumption, this is a positive finding since it denotes a certain social awareness about the harmfulness of drinking during pregnancy. There is also a significant drop in cannabis use during pregnancy, with figures falling close to zero. This behaviour has been associated with fear of harming the foetus, stigma, and guilt feelings (Vanstone et al., 2021).

The prevalence of e-cigarette smoking was anecdotal in all three time periods assessed, despite the fact that in some countries the use of these devices is spreading at the population level and becoming part of harm reduction strategies (Obisesan et al., 2020). Nevertheless, the assessment of e-cigarette smoking during pregnancy should be based on a fundamental principle, the precautionary principle, since its impact on foetal health is not yet established (Larcombe, 2019).

The change in ETS exposure was also paradoxical since, unlike tobacco smoking, which rose after childbirth, exposure continued to decrease postpartum. According to a qualitative study conducted in the postnatal period, the reason for this may be that most women are concerned about the link between smoking and increased risk of sudden infant death syndrome, and some are worried about the increased likelihood of their child becoming a smoker by seeing people smoking (Brown et al., 2019). On the other hand, although women perceive the status of “mother” as a motivating factor for not smoking, they also consider that smoking tobacco and/or cannabis is useful and safe for coping with stress and to aid rest postpartum (Brown et al., 2019; Vanstone et al., 2021), leading to the conclusion that when they do smoke tobacco or cannabis, they do so not in the presence of the baby or they hide it. Although this is positive, we cannot ignore the risk of exposure to second- (or third-hand) smoke for those women who smoke, even if they do not do so in the presence of their child. Of the mothers who declared that their child was not exposed to ETS, 8.2% always smoked at home, so it is likely that they were not identifying the child’s exposure. Although more studies are needed to characterize the medium and long-term consequences of exposure to environmental tobacco smoke, given the unique characteristics of babies and children when compared to adults (crawling, sucking from hand to mouth...) and because of their developmental process, it seems likely that this population is especially vulnerable to exposure to environmental tobacco smoke (Díez-Izquierdo et al., 2018).

The influence of educational level on health-related behaviours in the general population has been established (Haeberer et al., 2020). It could therefore be said that these

behaviours are educational-level dependent, given that people with a higher level of education adopt healthier lifestyles. The influence of educational level on behavioural changes during pregnancy has not previously been assessed. The results are encouraging given the observation that, regardless of educational level, the changes in behaviour made during pregnancy were generally in the direction of improvement. However, their worsening after childbirth is once again dependent on educational level, since these negative changes were stronger among women with a lower educational level.

Furthermore, preconception, pregnant women with a lower educational level faced the worst scenario, presenting higher prevalence of risk behaviours, which is in line with earlier studies (Hill et al., 2014). Conversely, we found that alcohol use increases with educational level. A study in the general population had already pointed out a higher prevalence of drinking alcohol at higher levels of study (Rey-Brandariz et al., 2021).

This study presents certain limitations related to its cross-sectional design and the retrospective collection of data through maternal self-report. It is possible that there is a memory bias, given that mothers answered questions postpartum (at the time of the survey) which referred to the preconception period and pregnancy. Furthermore, there may be a social desirability bias, resulting in concealment of behaviours that are harmful to health and, therefore, in an underestimation of prevalence. Moreover, the period taken into account postpartum (3 to 16 months) is very long and may have influenced results. Other limitations derive from not having included underage pregnant women or pregnant women who did not give birth to a live child, and from not having quantified the amount of tobacco (cigarettes), alcohol, e-cigarettes and cannabis consumed by the women. It should also be noted that the questions assessing quality of diet were limited, with important items such as the consumption of processed foods or sugary drinks not included, and the degree to which healthy diet recommendations were adopted was not quantified. It is important to highlight that the level of education is a proxy, probably imperfect, of socioeconomic level. Thus, it must be taken into account that pregnancy-related dietary changes could represent an extra financial burden or added cost, since they are associated with greater consumption of more expensive foods, such as meat, fruits, vegetables or fish (Grenier et al., 2021).

The main strength of this study is the high participation rate and the large sample size since it included one in three of the almost 19,000 mothers who gave birth in Galicia during the period considered. Furthermore, the sample design allows conclusions to be generalized, given that the women did not come from a specific health system and were a representative sample of pregnant women.

Conclusions

Regardless of educational level, behaviour change occurs during pregnancy, with mothers adopting healthier lifestyles. However, after childbirth there is a worsening of behaviours, with the exception of ETS exposure. Based on the results, we consider that the message regarding the influence of educational level on parental lifestyle is clear since women with a higher level of education have better lifestyles. Understanding why maternal behaviour worsens again after childbirth, having improved during pregnancy, could help generate effective health promotion recommendations that eliminate false beliefs and communicate the risks entailed by parental behaviours with regard to children's health. The design and implementation of interventions associated with the establishment of healthy habits before pregnancy, during pregnancy and after childbirth should be education-level dependent.

Acknowledgments

This study has received funding from the National Drug Plan (Project Code 2021I009).

Conflict of interests

The authors declare no conflicts of interest.

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Annex 1. Prevalence of health-risk behaviours before pregnancy (pre), during pregnancy (pregnancy) and after childbirth (post)

No risk behaviour refers to the fact that the women declared that they complied with dietary recommendations, did not eat tuna or swordfish, did not use tobacco, alcohol, cannabis or e-cigarettes and that they were not exposed to environmental tobacco smoke (ETS).

