

Migraine and pregnancy: an internet survey

Gianni Allais · Sara Rolando · Cristina De Lorenzo ·
Gian Camillo Manzoni · Paolo Messina · Chiara Benedetto ·
Florindo d’Onofrio · Vincenzo Bonavita · Gennaro Bussone

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Abstract Data in the literature show that migraine tends to improve during pregnancy in most migrainous women. The aim of this Internet survey was to obtain the most likely cross section of the situation in the general population with respect to the presence and course of migraine in pregnancy. All women who participated were asked to answer questions pertaining to their history of pregnancy and headache. One thousand and eighteen women participated in the survey; only 775 met the eligibility criteria for inclusion. One hundred and ninety-five women (25.2 %) reported having had a headache only before pregnancy, 425 (54.8 %) before and during pregnancy, and 155 (20.0 %) only during pregnancy. Women suffering from headache before and/or during pregnancy were much more likely to

have headaches with more migrainous features at the ID Migraine Screener test when compared to women whose headache began during pregnancy. “Definite migraines” were 277/620 (44.7 %) and 26/155 (16.8 %), respectively, in the two groups ($p < 0.0001$). Among the 620 females that suffered from headache before pregnancy, 375 (60.5 %) improved, 195 (31.5 %) showed complete resolution of the disorder, and 180 (29.0 %) had a reduction in headache frequency. Moreover, the multinomial logistic model (with headache pattern as dependent variable) proved fetal presentation as significant ($p = 0.0042$). Women with “new headache” (No/Yes pattern) had an OR (95 % CI) of 1.9 (1.2–3.0) of breech presentation at delivery versus those with a stable pattern of headache (Yes/Yes). Finally, women with not recent pregnancy stated they suffered from headache less than the women with recent pregnancy.

G. Allais (✉) · S. Rolando · C. De Lorenzo · C. Benedetto
Department of Gynecology and Obstetrics, Women’s Headache
Center, University of Turin, Via Ventimiglia 3, 10126 Turin,
Italy
e-mail: gb.allais@tiscali.it

G. C. Manzoni
Department of Clinical and Experimental Medicine,
University of Parma, Parma, Italy

P. Messina
Laboratory of Neurological Disorders,
Mario Negri Institute-IRCSS, Milan, Italy

F. d’Onofrio
Institute of Neurology, San G. Moscati Hospital, Avellino, Italy

V. Bonavita
Institute of Diagnosis and Therapy Hermitage, Capodimonte,
Naples, Italy

G. Bussone
Department of Clinical Neuroscience, Headache Unit,
C. Besta Neurological Institute and Foundation, Milan, Italy

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Introduction

Migraine has a wide diffusion in the general population [1] and it tends to improve during pregnancy in most migrainous women.

However, statistics about the course of migraine often only take into account patients referred to Headache Centers and could therefore show different results from what might be the real course in the general population.

Internet is a way to contact not only the general population, but also headache sufferers in general very quickly and directly. In the Web, one can find sites dedicated mainly to pregnant women. They report tips and advice to

manage different kinds of problems that could arise in pregnancy and also offer reassurance about the normal course of this very delicate situation in a woman's life. Under the aegis of the Italian Headache Foundation (Fondazione Italiana Cefalee, F.I.CEF Onlus), we conducted an online survey through three female sites dedicated to pregnancy, with questions about the course of headache during pregnancy.

The purpose of this survey was to obtain the most likely cross section of the situation in the general population with respect to the presence and course of migraine in pregnancy.

Patients and methods

The survey was presented online between October 2011 and January 2012 on the following Italian websites: <http://www.ilmioobaby.com>, <http://www.esseredonnaonline.it>, and <http://www.ilclubdellamamme.com>. The eligibility criteria to participate in the survey were female sex and reporting a history of headache. All women who participated in the survey were asked to answer 17 questions. All answers were transferred into a database for statistical analysis. The database comprised: the filling date; the current pregnancy status (Yes, No); the week of pregnancy, if pregnant at the moment of answering; childbirth within 3 months (Yes, No); breast-feeding status (Yes, No); presence of headache before the pregnancy (Yes, No); presence of headache during the pregnancy (Yes, No); the three questions that make up the ID Migraine Screener test: nausea or vomiting (Yes, No), photosensitivity (Yes, No), limited daily activities during headache (Yes, No); presence of aura during headache (Yes, No); aura occurrence (already present before the pregnancy, only during pregnancy); frequency of headache (more frequent during pregnancy, same frequency before and during pregnancy, less frequent during pregnancy); intensity of headache (more intense during pregnancy, same intensity before and during pregnancy, less intense during pregnancy); nausea or vomiting during pregnancy outside headache (Yes, No); in the case the delivery has just occurred: the modality of the childbirth (natural, cesarean, with forceps) and fetal presentation at delivery (cephalic, breech). No missing data were allowed and a response was missing only when not applicable.

Statistical analysis

Descriptive statistics are presented as count and percentages. All women who participated in the questionnaire were classified in a pattern due to their history of headache as regards being pregnant: "Only before pregnancy"

(pattern Yes/No), "Both before and during pregnancy" (pattern Yes/Yes), "Only during pregnancy" (pattern No/Yes). The ID Migraine Screener test [1, 2] was used to classify subjects in "Definite migraine" (3/3 positive answers), "Probable migraine" (2/3), "Unlikely migraine" (1/3), "Other headaches" (0/3).

Headache status, headache pattern, and the ID Migraine Screener scores were correlated with each other based on the presence of aura, the modality of the childbirth and the fetal presentation at delivery. The whole variables were also evaluated in a multivariate model with headache status and pattern set as dependent variables in a multivariate logistic and in a multivariate, multinomial logistic analysis, respectively, in order to assess independent predictors of headache. The alteration of the frequency and intensity of headache before and after the pregnancy and aura occurrence were detected and correlated with the ID Migraine Screener scores. All the analyses were repeated and compared in the subgroups of women pregnant at the time of the survey, who had delivered a baby within 3 months or were currently breast-feeding versus other women in order to assess potential selection or recall bias with the Mantel–Haenszel χ^2 for heterogeneity. All tests were two-tailed with significance set to $\alpha = 0.05$. Data were analyzed using the Statistical Analysis System (SAS Institute, Inc., Cary, NC, USA) package for PC (version 9.2).

Results

One thousand and eighteen women participated in the survey (Fig. 1). Two hundred and forty-three of them were excluded from the analysis since they incorrectly filled in the online survey. Therefore, 775 women were included in the current analysis.

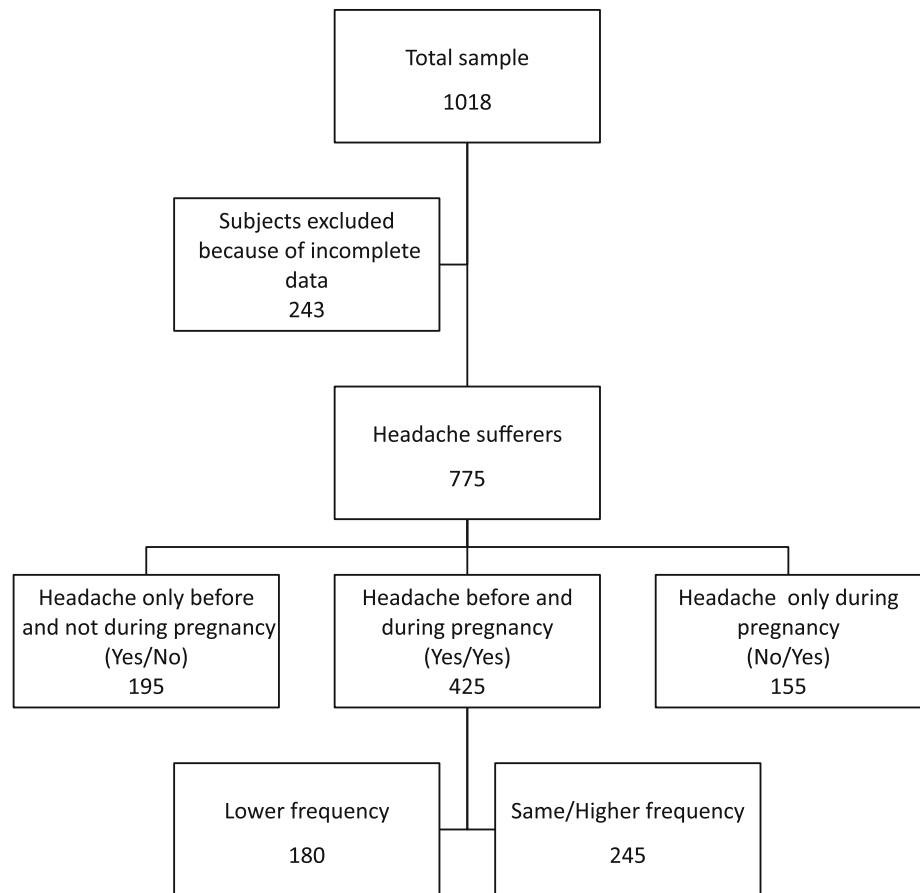
Two hundred and sixty-seven women (34.5 %) were pregnant at the moment of the survey, with a median week of pregnancy of 20 and 100 (12.9 %) had delivered a baby within the prior 3 months. In only one case, a woman was already pregnant and delivered within 3 months. Two hundred and six women (26.7 %) were breastfeeding.

One hundred and ninety-five women (25.2 %) reported having had a headache only before pregnancy, 425 (54.8 %) before and during pregnancy, and 155 (20.0 %) only during pregnancy.

The ID Migraine Screener results were as follows: definite migraine (3/3) 303 women (39.1 %); probable migraine (2/3) 263 women (33.9 %); unlikely migraine (1/3) 147 women (19.0 %); other headaches (0/3) 62 women (8.0 %).

Since 425 women declared having or having had headache both before and during pregnancy, 133 (31.3 %) had a higher frequency, 180 (42.4 %) had a lower frequency, and 112 (26.3 %) had the same frequency of headache during

Fig. 1 Flow chart of the study



pregnancy. Furthermore, 111 (26.1 %) had a higher intensity, 107 (25.2 %) had a lower intensity, and 207 (48.7 %) had the same intensity of headache during pregnancy.

Among the migraine symptoms considered in the ID Migraine Screener test, nausea or vomiting were reported by 395 women (51.0 %), photosensitivity by 545 (70.3 %), and limited daily activities by 642 (82.8 %).

The headache pattern and ID Migraine scores were correlated and the results are reported in Table 1.

Women suffering from headache only before pregnancy or both before and during pregnancy were much more likely to have higher ID Migraine scores (i.e., headaches with more migrainous features) when compared to women

whose headache began during pregnancy. “Definite migraines” were 277/620 (44.7 %) and 26/155 (16.8 %), respectively, in the two groups ($p < 0.0001$). Conversely, other forms of headaches (0/3 or 1/3 in the ID migraine scores) were represented much more in the subgroup showing headache onset only during pregnancy versus the other two: 77/155 (49.7 %) versus 132/620 (21.3 %) ($p < 0.0001$). More specifically, the difference between these two clusters (women with vs. women without headache before pregnancy) was significantly different in each of the symptoms of the ID Migraine Screener as shown in Table 2.

Among the 620 females that suffered from headache before pregnancy, 375 (60.5 %) improved: more precisely,

Table 1 Headache pattern relative to the time of onset during the pregnancy (Yes/No, Yes/Yes, No/Yes) versus ID migraine screener scores

Headache pattern	Other headaches (0/3)	Unlikely migraine (1/3)	Probable migraine (2/3)	Definite migraine (3/3)
Only before pregnancy (Yes/No)	11 (5.6 %)	27 (13.9 %)	76 (39.0 %)	81 (41.5 %)
Before and during pregnancy (Yes/Yes)	24 (5.7 %)	70 (16.5 %)	135 (31.8 %)	196 (46.1 %)
<i>p</i> value (heterogeneity)	0.3536			
(Yes/No + Yes/Yes)	35 (5.6 %)	97 (15.6 %)	211 (34.0 %)	277 (44.7 %)
Only during pregnancy (No/Yes)	27 (17.4 %)	50 (32.3 %)	52 (33.6 %)	26 (16.8 %)
<i>p</i> value (heterogeneity)	<0.0001			

Table 2 Correlation between pattern relative to the time of onset during the pregnancy and the specific symptoms of the ID migraine screener test

Headache pattern	Nausea or vomiting (Yes) <i>n</i> (%)	<i>p</i> value	Photosensitivity (Yes) <i>n</i> (%)	<i>p</i> value	Limited daily activities (Yes) <i>n</i> (%)	<i>p</i> value
Only before pregnancy (Yes/No)	237 (55.8)		372 (87.5)		319 (75.1)	
Before and during pregnancy (Yes/Yes)	110 (56.4)	<0.0001	166 (85.1)	<0.0001	146 (74.9)	<0.0001
Only during pregnancy (No/Yes)	48 (31.0)		104 (67.1)		80 (51.6)	

195 (31.5 %) showed complete resolution of the disorder and 180 (29.0 %) had a reduction in the frequency of the headache episodes (Fig. 1).

As shown in Table 3, we merged into a single group called “improved” ($n = 375$) those patients who had headaches before pregnancy but did not complain about them any more during pregnancy ($n = 195$) and those patients who reported only a decline in the frequency of the crisis during pregnancy ($n = 180$). The scores of the ID Migraine Screener test showed no significant difference regarding those who had a headache that was unvaried or had worsened during pregnancy ($n = 245$).

Women with aura were distributed identically in the three groups (improved, stable/worsened, headache only during pregnancy) with a proportion of around 30 % (see Table 4). Subdividing the women into three groups based on the week of pregnancy when the survey was conducted, <15 weeks, 15–26 weeks, and >26 weeks, respectively, it is clear that the women who reach the third trimester of pregnancy are the ones that show a more favorable statistically significant trend (Table 5). Of the women who have not yet gone beyond the 14 weeks, 24/58 (41.1 %) improved and 34/58 (58.6 %) did not improve; of the women between the 15 and 26 weeks, 32/88 (36.4 %) improved, and 56/88 (63.6 %) did not improve; and of the women beyond the 26 week, 32/53 (60.4 %) improved, and 21/53 (39.6 %) did not improve.

There was no association between nausea (apart from headache-related) and headache pattern. Women who never had headache reported a lower frequency of nausea. Furthermore, there was an inversely significant trend ($p = 0.0247$) between week of pregnancy and nausea.

Table 6 reports the correlation between the presence of headache during pregnancy, headache pattern and ID

Table 4 Trend of headache frequencies versus presence of aura

Headache trend	Aura	
	No	Yes
Improved ($n = 375$)	245 (65.3 %)	130 (34.7 %)
Stable/worsened ($n = 245$)	167 (68.2 %)	78 (31.8 %)
<i>p</i> value	0.4656	
Improved or stable	412 (66.5 %)	208 (33.5 %)
Only during pregnancy (No/Yes)	113 (72.9 %)	42 (27.1 %)
<i>p</i> value	0.1243	

Table 5 Trend of headache frequencies versus stages of pregnancy

Headache trend	Week of pregnancy		
	<15 <i>n</i> (%)	15–26 <i>n</i> (%)	>26 <i>n</i> (%)
Improved ($n = 88$)	24 (27.2 %)	32 (36.4 %)	32 (36.4 %)
Stable/worsened ($n = 111$)	34 (30.6 %)	56 (50.5 %)	21 (18.9 %)
<i>p</i> value	0.0183		

Migraine Screener scores and the fetal presentation at delivery and the occurrence of aura during the pregnancy. The χ^2 showed a significant correlation between fetal presentation at delivery and headache pattern ($p = 0.0071$). Specifically, the pattern identifying the presence of headache only in pregnancy was associated with an increased number of breech presentations at delivery (24.0 vs. 11.8 %; and vs. 13.0 % of the other headache patterns).

Moreover, an increasing ID Migraine Screener score was found significantly associated with the presence of

Table 3 Trend of headache frequencies versus ID migraine screener scores

Headache trend	Other headaches (0/3)	Unlikely migraine (1/3)	Probable migraine (2/3)	Definite migraine (3/3)
Improved ($n = 375$)	19 (5.1 %)	54 (14.4 %)	123 (32.8 %)	179 (47.7 %)
Stable/worsened ($n = 245$)	16 (6.5 %)	43 (17.6 %)	88 (35.9 %)	98 (40.0 %)
<i>p</i> value (heterogeneity)	0.2713			

Table 6 Correlation between the presence of headache during pregnancy, headache pattern (Yes/No, Yes/Yes, No/Yes), ID Migraine Screener score and the fetal presentation at delivery and the aura occurrence during pregnancy

No n (%)	Headache during pregnancy		p value	Headache pattern			p value	ID migraine screener scores				p value
	Yes n (%)	p value		Yes/No n (%)	Yes/Yes n (%)	No/Yes n (%)		0/3 n (%)	1/3 n (%)	2/3 n (%)	3/3 n (%)	
Fetal presentation at delivery												
Natural	154 (87.0 %)	349 (85.1 %)	$p = 0.5498$	154 (87.0 %)	270 (88.2 %)	79 (76.0 %)	$p = 0.0071$	31 (77.5 %)	102 (90.3 %)	162 (83.5 %)	208 (86.7 %)	$p = 0.1675$
Breech	23 (13.0 %)	61 (14.9 %)		23 (13.0 %)	36 (11.8 %)	25 (24.0 %)		9 (22.5 %)	11 (9.7 %)	32 (16.5 %)	32 (13.3 %)	
Aura occurrence												
No	123 (63.1 %)	402 (69.3 %)	$p = 0.1072$	123 (63.1 %)	289 (68.0 %)	113 (72.9 %)	$p = 0.1463$	53 (85.5 %)	109 (74.2 %)	171 (65.0 %)	192 (63.4 %)	$p = 0.0003^*$
Yes	72 (36.9 %)	178 (30.7 %)		72 (36.9 %)	136 (32.0 %)	42 (27.1 %)		9 (14.5 %)	38 (25.8 %)	92 (35.0 %)	111 (36.6 %)	

* Armitage χ^2

aura during pregnancy ($p = 0.0003$). Specifically, the higher the probability that the headache was a migraine, the higher the proportion of subjects with aura occurrence (14.5, 25.8, 35.0, and 36.6 %, respectively, for women with the scores 0/3, 1/3, 2/3, and 3/3 in the ID Migraine Screener test).

Headache status at pregnancy was not significantly associated with childbirth modality, fetal presentation, or aura occurrence at pregnancy (neither in the multivariate nor in the univariate model). Conversely, the multinomial logistic model (with headache pattern as dependent variable) proved fetal presentation ($p = 0.0042$) as significant. Women with “new headache” (No/Yes pattern) had an OR (95 % CI) of 1.9 (1.2–3.0) of breech presentation at delivery versus those with a stable pattern of headache “Yes/Yes”. All logistical models were also adjusted by nausea occurrence independently from headache (not significant).

Table 7 reports the correlations between headache frequency, intensity and aura occurrence with week of pregnancy in the subgroup of women currently pregnant without detecting any significant difference. The week of pregnancy seems to not have a significant role in increasing/decreasing frequency or intensity even if women in the last trimester (>26 weeks) had a prevalently lower frequency (47.5 %) compared to women in the first (34.1 %) or second (34.6 %) trimester.

Among women currently breast-feeding (206), 119 (57.8 %) improved, 49 (23.8 %) were stable and 38 (18.4 %) had their first headache during pregnancy. When compared to women not currently breastfeeding (569), the latter were worsening (45.0 % improved, 34.5 % were stable, 20.6 % had a new headache) ($p = 0.0043$).

Table 8 shows that women with current or recent pregnancy were different from women with not recent (remote) pregnancy; indeed the latter stated they had suffered less from headache during this pregnancy than the first.

Discussion

Due to the particular way, we chose to conduct this investigation, namely by recruiting the cases online, we were not allowed to use specific, previously validated questionnaires [4] to diagnose migraine. As that would have been too time-consuming, we opted for the easier and more convenient ID Migraine Screener test, which shows a high degree of sensitivity and specificity [2, 3].

The majority of epidemiological studies demonstrate that pregnant women suffering from headaches prior to pregnancy report an improvement ranging from 55 to 90 % of cases [5]; in our study, we found an improvement in 60 % of cases (375/620) and the total disappearance of attacks in 195 cases (31 %).

Table 7 Headache frequency, intensity and aura occurrence in pregnant women

Frequency	Intensity			Aura				
	Higher	Lower	Same	Higher	Lower	Same	No	Yes
Week of pregnancy								
<15	19 (36.5 %)	18 (34.6 %)	15 (28.9 %)	17 (32.7 %)	11 (21.2 %)	24 (46.2 %)	35 (67.3 %)	17 (32.7 %)
15–26	37 (43.5 %)	29 (34.1 %)	19 (22.4 %)	23 (27.1 %)	21 (24.7 %)	41 (48.2 %)	63 (74.1 %)	22 (25.9 %)
>26	10 (25.0 %)	19 (47.5 %)	11 (27.5 %)	11 (27.5 %)	13 (32.5 %)	16 (40.0 %)	28 (70.0 %)	12 (30.0 %)
<i>p</i> value (heterogeneity)	0.3325			0.7413			0.6822	

Table 8 Headache in women with recent versus not recent pregnancy

	Not recent pregnancy <i>n</i> (%)	Recent pregnancy <i>n</i> (%)	<i>p</i> value
Headache during pregnancy			
No	97 (34.4 %)	98 (19.9 %)	<0.0001
Yes	185 (65.6 %)	395 (80.1 %)	
Headache pattern			
Only before pregnancy (Yes/No)	97 (34.4 %)	98 (19.9 %)	<0.0001
Before and during pregnancy (Yes/Yes)	141 (50.0 %)	284 (57.6 %)	
Only during pregnancy (No/Yes)	44 (15.6 %)	111 (22.5 %)	

With regard to the total disappearance of headache in pregnancy, if we consider only those women classified as Definite migraine ($n = 303$), 27 % of them ($n = 81$) show complete disappearance of the attacks. In the literature, the attacks disappeared in approximately 20 % of cases [6].

On the contrary, in a smaller contingent of pregnant women, there is an onset of headaches during pregnancy [7]; in our study, we found this phenomenon in 155/755 (21 %) of the women. However, some of these cases may have been caused by secondary headaches, in particular those linked to hypertensive disorders [5, 8]. In fact, our data did not allow us to investigate this aspect. Nevertheless, there were only 26 (3 %) if we consider the new onset of headaches totaling 3/3 at the ID Migraine Screener test.

In our group of subjects, complete improvement is only seen in the third trimester of pregnancy, which is in partial contrast with other data in the literature that report an amelioration from the second trimester onwards.

The figure for the significant improvement in headache during lactation, which emerged from the answers to our survey, is substantially in line with that in the literature [9].

The opportunity to experience a resolution of headache during pregnancy does not seem to depend on the characteristics that the headache had before pregnancy. Indeed, if we subdivide women who showed headache before pregnancy on the basis of the answers to the ID Migraine

Screener test, we cannot find any statistically significant difference. Consequently, the trend of headache during pregnancy does not depend on whether primary headache had few or many aspects of migraine (Table 3).

We did not find any correlation between nausea (apart from headache-related) and headache pattern. The inverse correlation between week of pregnancy and nausea ($p = 0.0247$) is probably correlated with a very high presence of nausea in the normal population during the first weeks of pregnancy and not with the specific presence of headache.

To the best of our knowledge, one aspect that has never been shown in the literature before is the significantly greater presence of fetal breech presentation in a group of women who developed a headache only during pregnancy. Unfortunately, given the present state of knowledge, we are unable to find a pathogenetic explanation that justifies the datum.

Finally, we found that women with not recent pregnancy stated they suffered from headache less than the women with recent pregnancy.

Probably, women currently or recently pregnant who experienced headache were more likely to answer the survey or remembered the presence of pain better.

For this reason, the analyses pertaining to the association between headache and migraine, modality of childbirth, fetal presentation at delivery, and aura occurrence during pregnancy were re-evaluated in two subgroups. However, the Mantel–Haenszel heterogeneity test reported no significant differences between recent and not recent pregnancies (data not shown). For this reason, despite the selection bias, our results can be generalized.

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