

Pregnancy e-health: a multicenter Italian cross-sectional study on internet use and decision-making among pregnant women

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ABSTRACT

Background Our study aimed to estimate the prevalence of pregnancy e-health seekers in a large Italian sample; to explore the factors influencing the choices of the childbearing women regarding their lifestyles after internet consultation; and finally to investigate potential differences between primiparous and multiparous women in internet use to find information about pregnancy.

Methods A multicentre survey was carried out in seven Italian cities. Data were collected through a validated questionnaire administered in waiting rooms of outpatient departments by medical doctors. Respondents were questioned about their sociodemographic status, their use of the internet to seek pregnancy information and their consequent choices to modify their lifestyles. Data were analysed using descriptive statistics and logistic regression.

Results Almost all women were pregnancy e-health seekers (95%), including those who also received information from healthcare professionals. Indeed, the main reason for searching the web was the need of further knowledge on pregnancy-related topic, over and beyond other key advantages of the net such as anonymity, simplicity and rapidity. A higher likelihood of changing lifestyle after pregnancy e-health was observed among the women who searched institutional websites; declared more confidence in the information retrieved; participated into pregnancy-centred forum online; and were residents in Italy.

Conclusions To reduce the likelihood for women of both finding erroneous information or misinterpreting correct ones, healthcare professionals should commit to fill the information gap and guide pregnant women in the online searches. Also, future studies are strongly needed to analyse the quality and accuracy of health information found on the web.

BACKGROUND

In the first quarter of 2012, according to Internet World Stats data updated on June 2012 there were around 2.4 billion internet users worldwide, and Italy posted the fourth highest growth in internet users worldwide in the period April 2011–April 2012 (+24%).¹

After the introduction of the web at the end of the last century and the growth rate for internet use in the past decade,^{2–3} people have been able to look for and find health information from anywhere in the world by simply using general search

engines.⁴ Scientific literature investigating the patients' use of the web to search for health information and its consequences in doctor–patient relationships is widely available.^{5–9}

This phenomenon is part of the emerging field of the e-health that is widespread worldwide. According to Eysenbach, e-health is a new way for a healthcare practice that aims at improving healthcare locally, regionally and worldwide by using information and communication technology.¹⁰

Interestingly, the majority of the population, in Europe as well as in America, have used the web at least once with e-health purposes.^{11–13} A direct consequence of this practice has been the pivotal role of the internet in increasing the empowerment of patients through their frequency of online self-help groups and discussion forums.⁴ However, a critical issue such as inequalities in access to the web services and information can occur. In this regard, a previous study conducted in Italy showed that the women were more likely to practice e-health (61.6% vs 50.2% of male users) and pointed out that this phenomenon is strictly age-related with a greater use (78.8%) among 30-year-olds to 41-year-olds.^{8–14} Lima-Pereira *et al*¹⁵ also found a positive correlation between use of the web and age with around 32% of women and men between 16 and 24 years of age have searched for health topics online.

Considering these data, of particular concern is the situation of women facing a pregnancy. Indeed, after the web consultation, women could make behavioural choices and it may be crucial to access evidence-base information.^{3–16} It is known that pregnancy-related websites are increasingly available on the internet and pregnancy e-health is practiced.^{3–9–13–15–17–19} A US survey reported that more than 75% of pregnant women practiced pregnancy e-health.^{9–20} An Italian study, evaluating the role of the internet in providing evidence-based information to women searching for information about teratogenic risk factors and women's risk perception reported a similar result with 72.4% of the participants consulted a web source in the first trimester.²¹ Another study in Sweden found that 84% of women used the internet as a source of information on their pregnancy,¹⁸ and a Chinese survey showed a figure similar to that in the western countries.⁹ Most women search for information on the internet once a month or more, most often during early stages of pregnancy when they have recently entered into a new life situation.¹⁸

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These few studies have explored pregnant women's use of the internet as a source of health information in western countries. In Italy, however, there has been only one study on e-health practice by childbearing women to obtain pregnancy-related health information.²¹ Moreover, no study has focused its aims on the potential differences between primiparous mothers and those who already had children, although a recent survey showed that 11% of primiparous mothers cite the internet as its first source of information,²² and another study indicated the primiparous status as one of the main predictors of internet use.²³

The purposes of our study were to estimate the use of internet among pregnant women in a large Italian sample to explore the factors influencing the choices of the childbearing women regarding their lifestyles after internet consultation and to analyse potential differences between primiparous and multiparous women in pregnancy e-health seek.

METHODS

We carried out a multicentre cross-sectional study in seven Italian cities (Cassino, Chieti, Palermo, Roma, Siena, Torino and Udine), so participating women were from different geographical areas of the country. A sample size was calculated on the basis of the number of new births in 2010 in every city of the study.²⁴ Considering the data available in a previous Italian study about the e-health in Italian women (around 37%), it was possible to provide an estimation of the number of interviews necessary in order to get valid data. We considered a $\pm 20\%$ of internet usage as 'Worst Acceptable' for results. The confidence level was set at 95% and the power of the study was considered to be 80%.

In order to assess the use of the internet by childbearing women for health-related purposes, with particular reference to pregnancy-related ones, participants were recruited in the waiting rooms of outpatient departments while they were looking forward an ordinary check-up with ultrasound scans or blood tests. The interview was proposed during the time of the ambulatory visits (in the morning and in afternoon). Eligibility criteria were: women aged ≥ 18 , normal pregnancies (without complications) and women able to understand the questionnaire in the original version (Italian language).

We administered an ad hoc questionnaire in an anonymous and voluntary form. The questionnaire was validated through a pilot study.²⁵

The Ethics Committee of the 'Sant'Anna' University Hospital of Torino approved the protocol, and all participants were asked to sign an informed consent form.

The questionnaire

All questionnaires were administered by previously trained medical doctors but were self-compiled. Information was collected on sociodemographic characteristics including age, marital status, education and employment. Similarly to Kummerwold, Renahy and Andreassen studies,^{12 26 27} respondents were asked to indicate their own self-perception of health status, that was assessed with a validated numeric related scale from 0 to 10; we considered the range 0–5 as 'poor', 6–8 as 'moderate' and 9–10 as 'excellent'. A second part of the questionnaire was related to the use of the internet for general purposes as well as pregnancy-related topics. This part included nine sections for a total of 73 subitems:

1. General internet use (n. 4 items)
2. Aim of the search and type of information searched during preconceptional (ie, pregnancy information, fetus health, pregnancy calendar) (n. 10 items)

3. Specific aim of the search about pregnancy status and type of information (n. 13 items)
4. Specific aim of the search about delivery and type of information (n. 5 items)
5. Specific aim of the search about the fetus/newborn health and type of information (n. 12 items)
6. Specific reasons regarding the access to internet (n. 5 items)
7. Attitude towards and grade of reliability of the website search (n. 6 items)
8. Impact of web's information on health choices (n. 12 items)
9. Potential reasons for searching on internet rather than (or in addition to) talking face-to-face with a health professional (n. 6 items)

Statistical analysis

Statistical analyses were carried out using STATA V.11 (Stata Corp, College Station, Texas, USA, 2011). Initial descriptive statistics included the χ^2 test to evaluate the differences in proportions between groups (primiparous and multiparous women). Logistic regression was used to assess the potential predictors of a lifestyle change after the web consultation (the behavioural change was actual and not hypothetical). The covariates to be included into the final model were selected using a stepwise forward selection process, with a univariate p value < 0.25 as the main criterium.²⁸ Results are expressed as OR with 95% CI, and a two-tailed p value < 0.05 was considered significant for all analyses.

RESULTS

Between November 2011 and September 2012, after contacting 1576 pregnant women aged 18–44 years, we interviewed 1347 responders (the mean age of respondents was 32.4 ± 5.4 years). We found indeed a refusal rate of about 17%, ranking from

Table 1 Internet use to find information about pregnancy

	Primiparous women % (N)	Multiparous women % (N)	p Value
Internet use	96.2 (760)	91.7 (474)	<0.001
Pregnancy e-health	98.0 (701)	97.6 (402)	0.6
Timing of research			
Before the doctor	60.1 (428)	57.6 (234)	0.4
After the doctor	56.1 (400)	50.2 (205)	0.06
Ways to access information			
General search engines	96.6 (687)	95.1 (385)	0.2
Hospital websites	15.8 (112)	15.8 (64)	0.9
Pharmaceutical company websites	2.0 (14)	2.5 (10)	0.6
Institutional websites	9.3 (66)	6.4 (26)	0.09
Advertising websites	2.5 (18)	2.0 (8)	0.6
Reasons for web use			
Quickness	60.8 (428)	59.3 (239)	0.4
Uneasiness	7.3 (51)	5.0 (20)	0.1
Deepening	49.8 (350)	55.3 (223)	0.08
Dissatisfaction	3.4 (24)	3.5 (14)	0.9
Other	7.4 (52)	7.0 (28)	0.8
Forum online use	8.9 (63)	12.9 (52)	0.04
Confidence in the information			
Poor	5.2 (37)	3.2 (13)	
Medium	21.5 (152)	29.0 (117)	0.01
High	73.2 (517)	67.8 (274)	

13% to 21%. After the exclusion of missing data about parity, the sample consisted of 790 primiparous women (60.5%) and 516 multiparous women (39.5%). Most women were Italian (89.4%), married (66.9%) and working (76.9%). More than 80% of women declared to have a medium or high educational level (high school/university) and a good/excellent self-perceived health. Internet users were found to be 94.6% of the total sample ($n=1274$; 96.2% of primiparous and 91.7% of multiparous women; $p<0.001$). Thirty-six participants reported delegating the search of pregnancy information, and they were not considered in the analysis. The rate of women using the internet for pregnancy-related purposes was 97.9% among the internet users, with no significant difference between primiparous and multiparous women (98.0% and 97.6%, respectively; $p=0.6$; table 1).

More than half of the women in both groups searched for information both before and after consulting a doctor, with no significant differences. The majority of women performed their research through general search engines (96.6% of primiparous and 95.1% of multiparous women; $p=0.2$), followed by the websites of their hospitals (15.8% in both groups; $p=0.9$). Among the reasons of web use, in complementary or in addition to the doctor, the most frequent ones were quickness of results retrieval (around 60% in both primiparous and multiparous

women) and the wish to deepen the knowledge ($\approx 50\%$ in both groups; $p=0.08$). Around 9% of primiparous and 13% of multiparous women declared to participate in online discussions about pregnancy using specific forum and blogs.

We divided the topics most searched by childbearing women according to four categories: 'reproduction phase', 'pregnancy', 'delivery' and 'newborn's health'. Concerning the 'reproduction' phase, the three most searched topics were the desire for pregnancy (37.2%), the calendar of ovulation (22.8%) and reproductive physiology (18.8%). As regards the 'pregnancy' phase, the three most searched topics were fetal development and prenatal tests calendars (51.3%), lifestyles in pregnancy (48.7%) and the physiology of pregnancy (39.8%). With regard to the 'delivery' phase, the most searched topics were pain relief (29.7%) and the place of delivery (29.1%), while for the 'newborn's health' phase were the breastfeeding (36.8%), the preservation of the umbilical cord (36.1%) and the health tips (29.2%).

Multivariate analysis

The results of the logistic regression model investigating potential independent predictors of a change in lifestyle after pregnancy e-health have been reported in table 2.

Since no significant differences were found in the univariate analysis between primiparous and multiparous women

Table 2 Potential predictors of a lifestyle change after 'pregnancy e-health'

	Crude OR	95% CI	Adjusted OR	95% CI
Age				
18–25-year-old	1 (Ref.)–	1 (Ref.)	–	–
26–35-year-old	1.27	(0.81 to 1.98)	0.93	(0.57 to 1.50)
>36-year-old	1.14	(0.71 to 1.84)	0.82	(0.49 to 1.37)
Nationality				
Foreign	1 (Ref.)	–	1 (Ref.)	–
Italian	0.52	(0.35 to 0.77)	0.51	(0.33 to 0.78)
Parity				
Primiparous	1 (Ref.)	–	1 (Ref.)	–
Multiparous	0.93	(0.72 to 1.23)	–	–
Marital status				
Unmarried	1 (Ref.)	–	1 (Ref.)	–
Cohabitant	1.24	(0.70 to 2.20)	1.12	(0.61 to 2.05)
Married	1.47	(0.86 to 2.50)	1.24	(0.71 to 2.17)
Other	1.79	(0.63 to 5.06)	1.32	(0.42 to 4.21)
Self perceived health				
Poor	1 (Ref.)	–	1 (Ref.)	–
Good	0.97	(0.89 to 1.05)	0.94	(0.85 to 1.03)
Timing of research				
Before the doctor	1.55	(1.18 to 2.02)	1.18	(0.87 to 1.59)
After the doctor	1.50	(1.15 to 1.95)	1.31	(0.98 to 1.74)
Research on lifestyle topics				
Yes	2.49	(1.90 to 3.26)	2.34	(1.74 to 3.13)
Research on institutional websites				
Yes	1.82	(1.18 to 2.83)	1.79	(1.11 to 2.88)
Confidence in the information				
Poor	1 (Ref.)	–	1 (Ref.)	–
Good	1.19	(1.09 to 1.29)	1.14	(1.03 to 1.26)
Understanding of the information				
Poor	1 (Ref.)	–	1 (Ref.)	–
Good	1.07	(0.97 to 1.16)	0.97	(0.88 to 1.08)
Participation into online forum				
Yes	1.92	(1.30 to 2.82)	1.66	(1.07 to 2.57)

(multiparous OR=0.93; $p=0.7$) we decided not to include this item in the regression model. The independent predictors of changing lifestyle after pregnancy e-health were research about lifestyle topics, such as nutrition, physical activity, tobacco and alcohol prevention (OR=2.34; $p<0.001$); research on institutional websites, such as the Ministry of Health or the 'Istituto Superiore di Sanità' websites (OR=1.79; $p=0.018$); good confidence in the information retrieved (OR=1.14; $p=0.008$); and participating in pregnancy-centred online forum (OR=1.66; $p=0.023$).

Conversely, Italian women were less likely to change their behaviour when compared to foreigners (OR=0.51; $p=0.002$). Self-perception of good or excellent health and age did not significantly influence lifestyle changes.

DISCUSSION

This multicentre Italian study was performed to investigate the influence of internet on the health choices of pregnant women, focusing on lifestyle behaviours and analysing possible differences between primiparous and multiparous women.

In our research internet users were found to be around 95% of the total sample with a small though significant difference by parity (96.2% of primiparous and 91.7% of multiparous women). Among the internet users, almost all used the internet for pregnancy-related issues. These findings confirm how this phenomenon is spreading worldwide according to international statistics.¹²

We found that some characteristics were associated with a higher likelihood of changing lifestyle behaviour after the web consultation: being foreigner, searching information on institutional websites, participating into online forum and having a greater trust/confidence in the information retrieved. This could be attributed to the propensity to discuss with other future mothers who share the same problems and doubts and consequently to be influenced by their opinion and personal experiences.

The differences related to nationality could be attributed to the different level of access to health services between Italian and foreign women and the potential different comprehension level of information provided by the healthcare workers, with the consequent need to seek and deepen the information on the web.²⁹

Furthermore, according to Lagan *et al*³ pregnant women use to share information through online discussion forums, in order to have support from other pregnant women or mothers. Our findings confirm this view and report that future mothers using online forums are more likely to change behaviour. Indeed, current literature report how the sharing of personal experiences in health-related websites could contribute in a substantial way to modify their own habits and health choices.³⁰

With regard to the association between intention to change and confidence on information retrieved, some studies reported that many internet users are sceptical on the reliability of internet-based information^{3 6 7}; while other studies, in line with our results (70.3% declared good/excellent confidence in the information retrieved), reported that most pregnant women considered the internet a highly reliable source of information.^{3 9 13 18 21 31} Importantly, we found that the majority of women used general search engines, followed by the hospitals' websites. These findings are in line with other studies exploring online health information seekers and could be judged alarming if we consider the results of the Pew Research Center Internet project,²⁴ where around 75% of e-health users declared they did not check the sources of the online information.³²⁻³⁴ At least, our results suggest that women

who do not consult the institutional websites are less likely to modify their lifestyles.

Although the internet use may have some positive consequences—women reported they feel empowered and informed after the e-health consultation, especially when they have to speak to health professionals as 'an equal'.^{3 34 35}—such a large reliance on online sources may also be alarming, given the several criticisms related to internet use and the subsequent potential harms^{9 36}: the incomplete comprehension by many women,^{3 37} the digital divide,^{8 14 38} the reliability and accuracy of information retrieved and the lack of a regulatory framework addressing this issue.^{9 17 37 38} However, it should be acknowledged that, on one side, the internet use cannot be stopped neither probably reduced (just because of anonymity, simplicity, comfort and rapidity), and on the other side there is a need of information that is not fully satisfied by health professionals. Indeed, in our study as in several others,^{7 9 13 18 39} the main reasons for searching on the web was deepening the knowledge on some specific topics. Thus, healthcare professionals should certainly try to provide more information to pregnant women, especially on those topics that are more frequently searched online (ie, fetal development and prenatal tests calendars), but they should also try to guide pregnant women in the online searches and recommend high-quality websites.^{4 9 13 15 21 32 34}

About the need of discussing with their physician the information found on the web, we can consider that greater benefits should be provided by physicians who help patients during their health-related search. The decision-making process, indeed, may improve if the burden of responsibility for knowledge is shared.⁴⁰

Finally, and importantly, there is a strong need for a systematic evaluation of the accuracy and credibility of the most commonly viewed websites on pregnancy-related issues.

This survey analysed the internet use on pregnancy-related issues for the first time in Italy, and its strengths were the multicentric design, the relatively large sample and the evaluation of some potential predictors that were never assessed so far. However, this study has also some limitations that must be considered when interpreting the results. First, the study was carried out in different Italian regions in both urban and rural areas in order to obtain a sample of the general population belonging to different Italian context. The interviews were carried out in the waiting rooms of outpatient departments while women were expecting an ordinary check-up with ultrasound scan or blood tests. A limitation of this study could be due to the geographical differences in the way women interface with health services based on the social and cultural patterns of the geographical areas. However, this issue will be addressed in future analyses of the same project. In addition, women refusing to answer the questions may be introspective or shy and for this reason a possible seeker of information on the internet. This could cause the potential loss of a part of the sample. In fact, we did not administer the survey by phone to reduce the likelihood of finding fewer significant results due to the higher rates of refusal or incompleteness.⁴¹ Moreover, the decision to use medical doctors to administer the questionnaire allowed us to have a greater participation in the research and to improve the compliance and the completeness of the questionnaires, with a consequent low refusal rate.

CONCLUSIONS

In this sample Italian pregnant women, almost all were pregnancy e-health seekers, including those who also received information from healthcare professionals. Indeed, the main reason

for searching the web was the need for further knowledge on pregnancy-related topics, over and beyond other key advantages of the Internet such as anonymity, simplicity and rapidity. To reduce the likelihood for women of both finding erroneous information or misinterpret correct ones, healthcare professionals should commit to fill the information gap and to guide pregnant women in the online searches. To do that, the operators need to increase their knowledge on the topics that are more frequently searched and on the websites that are more frequently viewed. In addition, future studies are strongly needed to analyse the quality and accuracy of health information found on the web.

What is already known on this subject

- ▶ It is known that pregnancy-related websites are more and more available on the internet and pregnancy e-health practiced.
- ▶ After the web consultation, women could make behavioural choices and it may be crucial to access evidence-base information.
- ▶ Most women search for information on the internet once a month or more, most often during early stages of pregnancy when they have recently entered into a new life situation.

What this study adds

- ▶ Our survey is the first investigating the internet use on pregnancy-related issues, focusing on possible differences between primiparous and multiparous women in Italy.
- ▶ Pregnancy e-health is widely spread in Italy (95%), without differences between primiparous and multiparous women.
- ▶ A higher likelihood of changing lifestyle after pregnancy e-health was observed among the Italian women who searched institutional websites, declared more confidence in the information retrieved; participated into pregnancy-centred forum online; were residents in Italy.

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participating the research. The collaborating group performed data collection. All authors read and approved the final manuscript.

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