An assessment of pregnant women’s knowledge and use of the Internet for medication safety information and purchase

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Abstract

Aim: The aim of this study was to assess pregnant women’s Internet searching activity about medication safety, knowledge and perceptions of medication risk and willingness to take prescribed and non-prescribed medication or make online medication purchases.

Background: Online medication advice for pregnant women is complex. The quality and veracity of this data is increasingly important as more midwives report women are bringing retrieved online information to clinical appointments. Pregnant women’s use of the Internet for seeking medication advice and purchasing medications has not yet been fully investigated.

Design: Online survey conducted from January - March 2013.

Findings: Of the 284 respondents, 39% were taking a medication when they became pregnant and 76% had searched the Internet for medication safety information. Analgesics were the most commonly searched category (41%). Health service sites were the most common online source and regarded as the most helpful and trusted. Regardless of age and education level, 90% of women agreed that if trying to become pregnant they would reconsider taking any medications because of the potential risk to their unborn baby. Forty-six percent of women with higher levels of education consider buying medication online as safe, a greater proportion than those of lower education. Five percent of women reported buying medication online.

Conclusion: The lack of specific recommendations for medication use during pregnancy is challenging for healthcare staff and pregnant women who need robust evidence to make informed treatment decisions. The Internet is a recognized, commonly accessed, source of medication information for pregnant women.

KEYWORDS

Internet, medication information, medication safety, medication use, midwifery, nursing, online survey, pregnancy

1 | INTRODUCTION

Previous research shows pregnant women use the Internet for information about all aspects of their pregnancy (Bjelke, Martinsson, Lendahl, & Oscarsson, 2016; Lagan, Sinclair, & Kernohan, 2011; Larsson, 2009) and early postnatal period, including medication usage (Bakhireva, Young, Dalen, Phelan, & Rayburn, 2010; De Santis et al., 2010; Sinclair, Close, McCullough, Hughes, & Liddle, 2014). As
part of EUROmediCAT, a daughter project of EUROCAT (European Surveillance of Congenital Anomalies), dedicated to investigating and improving medication safety during pregnancy and funded by the European Union (EU) Seventh Framework Programme in 2010. Lagan, Dolk, White, Uges, and Sinclair (2014) conducted a descriptive cross-sectional survey of 50 e-pharmacies. They demonstrated how easy it was to purchase isotretinoin (a known teratogenic drug that has a strict Pregnancy Prevention Programme [PPP] protocol) from 42 of the sites without a valid prescription (Lagan et al., 2014). The study also reported on the lack of safety information for the protection of pregnant women on the sites accessed. The study demonstrated the power of the Internet to provide the public with access to e-pharmacies and freedom to purchase prescription-only medications using the Internet as the portal of opportunity (Lagan et al., 2014). In the study reported here, we expand the focus to more generally pregnant women’s use of the Internet in the context of their knowledge and perceptions of safe medication usage in pregnancy.

1.1 | Background

The lack of evidence to inform specific recommendations for medication use by pregnant women has been identified as a critical issue for women’s health care (de Jonge et al., 2015; Thorpe et al., 2013; Thomas & Yates, 2012; Sundseth & Semancik, 2016) and this is challenging for healthcare staff and pregnant women who need robust evidence to make informed treatment decisions (Hansen et al., 2016). Due to the risk of potential harm to the foetus in a vulnerable state of development, pregnant women are usually excluded from premarking trials and scientific evidence depends on post-marketing observational studies (Thomas & Yates, 2012). Up to now, these have not provided sufficient scientific evidence to inform decision-making (Thorpe et al., 2013).

Women have been found to be more conservative about use of medication in pregnancy than when not pregnant (De Santis et al., 2010; Nordeng, Koren, & Einason, 2010a; Twigg, Lupattelli, & Nordeng, 2016; Zaki & Albarraq, 2014) and this is borne out by drug use studies specific to pregnancy (Bakker et al. 2006). Yet usage of medication by women, both prescription (Bakker et al. 2006; Stephansson et al., 2011) and over the counter (Thorpe et al., 2013) is high due to treatment needs for chronic and acute health conditions, risk of untreated conditions for both pregnant woman and unborn baby and inadvertent use before pregnancy is recognized. Older maternal age at childbirth has moreover led to an increase in women with chronic conditions who need medication.

A growing literature explores women’s knowledge and perceptions of medication safety in pregnancy. Surveys have found that women rate the risk of OTC medications such as analgesics to be relatively low but may rate the risks of certain prescribed medications to be higher than the evidence base suggests (Petersen, McCrea, Lupattelli, & Nordeng, 2015). Women’s beliefs and fear surrounding the safety of medications has an impact on their likely adherence to drug therapy (Bonari et al., 2005; Lupattelli, Picinardi, Einason, & Nordeng, 2014; Nordeng, Ystrøm, & Einason, 2010b; Nordeng, et al., 2010a; Twigg et al., 2016). Specific problems concerning medication use have been reported for pregnant women suffering from migraine (Amundsen, Øvrebø, Amble, Poole, & Nordeng, 2016), epilepsy (Widnes, Schjøtt, & Granas, 2012) and back pain (Sinclair, Close, McCullough, Hughes, & Lidde, 2014) among others.

Few studies have specifically explored pregnant women’s use of the Internet for medication safety information and none for online medication purchase. De Santis et al. (2010) described how 57% of a sample of 203 women in 2008–2009 who contacted an Italian Teratology Information Service helpline and thus were a sample of particularly concerned women, had accessed the Internet for drug exposure information, particularly in the first trimester. However, 22% had received incorrect information (over or underestimating the risks) and only 60% had found evidence-based answers. A survey of

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**Why is this research needed?**

- Some women are taking prescribed medication before becoming pregnant and many women need to take medications during pregnancy.
- Pregnant women are using the Internet to seek information about medications.
- Un-validated information sources on use of medications in pregnancy exist.

**What are the key findings?**

- Over a third of women were taking a medication at time of conception.
- Three quarters of the women had used the Internet to search for information about the safety of a medication in pregnancy with analgesics being the most commonly searched drug category.
- Health service sites were the most common online source and regarded as the most helpful and trusted.
- Few women currently purchase medications from e-pharmacies.

**How should the findings be used to influence practice/education?**

- The types and safety of medications being used by pregnant women require investigation.
- Pregnant women require help and guidance to access accurate and reliable medication information sources.
- Midwives and maternity care providers need to be alert to online searching by pregnant women, both for information and purchase and keep themselves appraised of the safety aspects.
Latina women in New Mexico also found the Internet to be commonly consulted for information and information seeking was associated with higher education and primiparity (Bakhireva et al., 2010). Health professionals, including midwives, have been urged to engage more actively with women’s use of the Internet for medication safety information (Bakhireva et al., 2010; Larsson, 2009; Weston & Anderson, 2014). No previous studies have been found about online purchase of medication by pregnant women.

There is little evidence about the Internet sources of information that women are accessing. Some Internet safe lists of medications use during pregnancy have been found to be inaccurate (Peters et al., 2013). Norby, Källén, Shemeikka, Korkmaz, and Winbladh (2015) reported that women found great value in the Swedish Internet database Medications and Birth Defects and reported it was easy to understand, however, only 11% (n = 29) had knowledge of it prior to the study. Van Calsteren et al. (2016) stated that: “many people still appear to prefer a search by ‘Dr Google’ and do not contact the specialized organizations” for information about pharmaceuticals. Therefore, there is a clear need to actively engage with pregnant women to establish where on the Internet they search for medication safety information and how they use that information to inform their medication taking and purchasing activity.

2 | THE STUDY

2.1 | Aim

The aim of this study was to assess pregnant women’s use of the Internet to search for information on medication safety during pregnancy; their knowledge and perceptions of medication risk; and willingness to take prescribed and non-prescribed medication or make online medication purchases.

2.2 | Methodology

2.2.1 | Design

An exploratory and descriptive approach was adopted using a specifically developed online questionnaire.

2.2.2 | Data collection tool

Online questionnaires have been used to collect data from pregnant women for the past 10 years and examples can be found in research by Lagan et al. (2011), Lupattelli, Picinardi, et al. (2014), Lupattelli, Spigset, and Nordeng (2014), Palosse-Cantaloube et al. (2014), Sinclair et al. (2014), Håmeen-Anttila et al. (2015), Petersen et al. (2015) and Twigg et al. (2016). For this study, a 72-item web-based questionnaire was designed for data collection based on pragmatism as online surveys conserve time and offer an economy of efficiency that is very attractive to both researcher and participant. The construction of the instrument was theoretically underpinned by Rogers (1983) Protection Motivation Theory and items from previously validated instruments were borrowed and adapted with permission from the authors (Lagan et al., 2011; Närhi et al. 2008; Peterson-Clark, Aslani, & Williams, 2010).

The questionnaire consisted mainly of closed questions (e.g. Have you ever purchased a medication from an Internet pharmacy while pregnant?) or seven-point Likert type scales from strongly agree to strongly disagree. The survey also asked some open questions, e.g., “Please name the medications would you be happy to take during pregnancy?” Questions were arranged in four sections: demographic information; attitudes to taking medications during pregnancy; use of the Internet for medication safety information during pregnancy and use of the Internet for medication purchase.

2.2.3 | Pilot study

A two-phase pilot study was conducted. First, a paper copy of the questionnaire was tested for content validity and reliability with ten female members of the EUROmediCAT project team. Following this pilot phase minor amendments were made and then an online version of the questionnaire was designed using “Qualtrics” (www.qualtrics.com) a software which provides a platform for online survey data collection and preliminary analysis. Next, a further pilot was conducted to check for potential logistic and technical problems with members of the team. Following minor calibration work the survey was uploaded onto the EUROmediCAT website (http://euromedicat.eu/) where it had a unique URL address.

2.2.4 | Sampling and recruitment

Only female volunteers who satisfied the following inclusion criteria were invited to participate in the study from January 2013 - March 2013: 18 years of age or over, currently pregnant or had a baby in the last year, living in the UK and able to read and understand English. Pregnant minors were excluded from the study due to difficulty obtaining parental consent in a timely and cost-effective manner.

This sample was drawn from the four UK countries. In the first instance, a search was undertaken to identify “women health and pregnancy” social media sites as possible platforms for advertising the study. However, the researchers were unable to get information about the study or a link to the survey posted on the “main” web pages of such relevant sites which potentially resulted in a poor response. To increase the response rate the survey was then administered to a panel of participants compiled by Qualtrics that fulfilled all the inclusion criteria. Willing participants were given the hyperlink to the participant information and consent page that provided details about the survey and what participating would involve and then a link to the questionnaire.

2.3 | Validity and reliability

The survey was piloted with a small sample of doctoral students and parents after a content validity check by an expert group of multi-professional researchers with expertise in online instrument
development, epidemiological research and medications in pregnancy. Cronbach’s alpha were used to estimate the internal consistency reliability of the three likert type scales and their items. All three scales had reliability coefficients above 0.60 (Attitudes to taking medications α = 0.63; Evaluating the quality of medication information online α = 0.87; Purchasing medicines from an Internet pharmacy scale α = 0.74).

2.4 | Ethical consideration

The study received ethical approval from the Ulster University Institute of Nursing and Health Research Ethics Filter Committee.

2.5 | Data analyses

Data were transferred directly from the Qualtrics survey tool into SPSS version 21 for analysis. The majority of the items in the survey had categorical response options. Frequencies are provided for the responses in the tables. For analysis purposes, the original seven point Likert response scales were collapsed into three point scales: “Disagree” (strongly disagree, disagree, somewhat disagree – Scored 1), “Unsure” (Scored 2) and “Agree” (strongly agree, agree, somewhat agree – Scored 3). The Pearson’s chi-square tests (or Fisher’s exact tests for cells less than five) were used to test significance between categorical variables. A two-sample t test was used to examine whether the sample mean of a single continuous variable was different between groups, e.g., young adults and older adults; or those that had obtained a university degree and those that had not. A p-value of ≤0.05 was considered significant.

3 | RESULTS

In total, 443 volunteers accessed the survey and 284 women completed the questionnaire. The demographic profile of the 284 participants is presented in Table 1. Women used the Internet to access information as it was easy to search and readily available. The main reason for searching for medications information was to ensure the safety of their unborn child.

3.1 | Use of the Internet for medication safety information in pregnancy

Over three quarters (76%, n = 217) of the women who participated in the study had personally used the Internet to search for information about the safety of a medication in pregnancy. This group were given a list of various online sources and asked if they had used them and if so, had they found the source helpful (Table 2) and trustworthy (Table 3).

For those women who had accessed online sources for information about the safe use of a medication in pregnancy (76%, n = 217) health service sites were the most used online source (93%, n = 201) and also the source the participants found helpful and most trusted (84%, n = 239). Although social media sites for pregnant women were the second most used source (85%, n = 185) they were also the second most cited source that was found by the participants as being unhelpful (18%), but also the second most cited source to be helpful (68%), they were trusted by 42% of respondents (n = 120). Although just over half (n = 115/217) of the women had accessed sites hosted by pharmacy/drug companies, almost a fifth of them found the sites unhelpful and there was no clear consensus on their trustworthiness. Of the women who used the Internet to search for drug safety information 53% (n = 115) of women shared this information with their midwife.

3.2 | Knowledge and perceptions of medication risk

The most common medication that women searched the Internet for information about were vitamins and minerals (45%, n = 97) and analgesics (pain killers) (41%, n = 89) (Table 4). Older women (80%
vs. 68%) and those with a university degree (82% vs. 67%) were more likely to read the information leaflet accompanying medications before becoming pregnant (p = .033 and p = .002 respectively). Women with a university degree (78% vs. 64%) were also more likely to report that they would always weigh up the benefits of taking a medication against the possible side-effects (p = .016) even before pregnancy.

For those who answered yes (46%, n = 100) to the question which asked if the information they sourced online influenced their decision about whether to take the medication during their pregnancy, they were asked to explain how. The majority said the information either verified or reassured them it was “ok” to take the medication or influenced their decision to not take the medication. On average women rated their ability to evaluate the validity and safety of information they sourced as high (Figure 1), however, they were less sure of their ability to recognize a regulated Internet pharmacy (Figure 2). Regardless of age and level of education, 90% (n = 256) of women “agreed” that if they were trying to become pregnant they would reconsider taking any medications because of the potential risk to the unborn baby and would consider the potential risks to their baby before taking any medications.

### 3.3 Medication use during pregnancy

Of the women who participated in the survey 29% (82) had a history of a chronic health condition and overall, 111 (39%) of the study participants were taking at least one medication that was not a mineral or vitamin when they became pregnant (Table 5). Of those taking medication, 55% (n = 156) altered their behaviour when planning a pregnancy or when they became pregnant; 22% (n = 43) made no pregnancy-related changes to their medication.

Over half of the women were not happy to take medication during pregnancy (n = 169, 60%). The vast majority of women would only take a medication during pregnancy if more harm could come to their unborn baby by not taking it (87%); only if it was absolutely necessary for their health (93%). However, 53% of the women indicated they would be happier taking a medication in the third trimester than the first and 41% of women said that there were some medications that they would take during pregnancy. Of the 115 participants who named medications they would be happy to take in pregnancy, 54/284 (19%) named paracetamol, with a further four (4%) women stating they would be happy to take “mild pain killers.” Ten (4%) women stated they would be happy to take antibiotics.
Regardless of age or educational level, the majority of women would not buy medications over the Internet whether they were pregnant (85%) or not (78%). This was mainly due to fear surrounding legitimacy, safety, quality, dosage and likelihood of receipt. Compared to women who did not have a university degree those that did said that websites should provide referenced, balanced evidence with details of the author and/or editor’s identity available (65% vs. 64% \( p = .0003 \)). Although two-fifth (40%, \( n = 1 \)) were unsure, a third (32.7%) of the respondents agreed that all genuine pharmacies should display their location and address.

Women with higher levels of education said that buying medications from online pharmacies was safe (42% vs. 26% \( p < .001 \)) and also would purchase a medication from an Internet pharmacy while pregnant if she could not obtain/buy the medication from a local pharmacy or doctor (54% vs. 46% \( p = .008 \)) or if it was cheaper (41% vs. 23% \( p = .004 \)) compared with women with lower levels of education, however, only 5% (\( n = 14 \)) of respondents had done so during pregnancy. Of these respondents, 10 women (71%) had been asked “sometimes” or never by the online pharmacy for a prescription and eight women (57%) had “sometimes” been asked if they were pregnant with the remainder never being asked (29%) or they could not remember being asked (14%). Six (43%) women were asked to complete a medical questionnaire. Of those women who purchased medications on the Internet 50% always received their medications.
order, while the rest received them occasionally or never. 200 (70%) women had never seen the symbol indicating that “This medication may harm your unborn baby if taken in pregnancy. Do not take while pregnant.” However, only 14% (n = 40) of women did not know what the symbol meant. Regardless of age and education level 75% of women stated that they would be unable to determine the difference between legitimate and illegitimate e-pharmacies.

4 | DISCUSSION

Participants in this study reported using the Internet as it was easy to search for information, readily available to them and convenient, which were also the main reasons for use reported by De Santis et al. (2010). Seventy-six percent of participants, who were all resident in the UK, accessed the Internet for information about the safety of medication during pregnancy. This is considerably higher than that reported by Twigg et al. (2016) who found only 49.6% (n = 257) of UK women used the Internet to research medicine use during pregnancy from November 2011 to January 2012. However, the participants in this study had a higher educational attainment compared with Twigg et al. (2016) (79.2% vs. 52.1% had progressed beyond high school) and this has been identified as a predictor for accessing the Internet for health activities (Bansil, Keenan, Zlot, & Gilliland, 2006; Kontos, Blake, Chou, & Prestin, 2014). Both our study and that of Twigg et al. (2016) conducted an online survey, which could bias participation towards women who use the Internet more readily.

Health service sites were the most commonly used online source and deemed to be the most “helpful” (93%) with most women trusting these sites (84%). This is echoed by Lemire, Paré, Sicotte, and Harvey (2008) who reported the perceived usefulness of the site itself and trust in the information retrieved were two of the most important factors in visiting a website. The least used sites were funded teratology information sites (63%) and safefetus.com (65%) an online database of worldwide medications updated and run by experts. However, the safefetus mobile phone app is due for release soon which may increase usage and access of this valuable resource. In total 85% of women used social media sites, such as Netmums to search for information. Such sites were reported as the second most helpful (68%) and also the second most unhelpful (18%). However, 58% of women were unsure or did not trust social media sites. Discussion forums were also viewed negatively by pregnant and postnatal women and midwives during a focus group study, the main reasons given being that they reported the personal experiences and opinions of other users instead of providing facts (Weston & Anderson, 2014). Other studies have reported that women have felt worried and concerned particularly after accessing information from online forums (Bjelke et al., 2016; De Santis et al., 2010). A French study by Palosse-Cantaloube et al. (2014) conducted an investigation of the first 10 pregnancy-related forum websites accessed by pregnant women searching for information about drugs and pregnancy and examined 115 of the posted questions. They reported the main drugs that women were concerned about included those used for the nervous system (such as AEDs), antibiotics and those used for the respiratory system. They concluded that nearly half of the drugs identified in online chats had not been evaluated properly for safe and effective use in pregnancy and when they explored the answers provided, only 7% of the 214 answers came from health professionals. The Position Statement from the European Board and College of Obstetrics and Gynaecology (EBCOG) (Van Calsteren et al., 2016) have called for a centralized, high quality, robust website to improve drug information provided to pregnant and lactating women.

McArdle, Flenady, Toohill, Gamble, and Creedy (2015) reported that most women (87%) preferred to use the Internet to supplement information given by their healthcare provider; however, midwives remain the preferred source of advice for pregnant women (Weston & Anderson, 2014). Importantly, over half (53%) of the women surveyed in our study had shared and discussed the information retrieved with their midwife which contrast with previous studies reporting only 24.9%-29% of women sharing their findings (Gao, Larsson, & Luo, 2013; Larsson, 2009). However, midwives reportedly lack of awareness and knowledge of authentic pregnancy websites and their use by and importance to, pregnant women (Weston & Anderson, 2014). It is recommended that antenatal HCP should be able to guide pregnant women to high-quality reliable sources of information online and assist them with interpreting and applying it (Lagan et al., 2011; Larsson, 2009; McArdle et al., 2015).

Older women and those with a university degree were more likely to make a more considered decision about the advantages or disadvantages of taking medications. Higher education and maternal age has previously been found to be associated with Internet usage and with a higher perception of risk of medications use during pregnancy (Bakhireva et al., 2010; De Santis et al., 2010; Grimes, Forster, & Newton, 2014; Nordeng, et al., 2010a; Van Deursen, van Dijk, & Peters, 2011). Education and age, however, had no bearing on women’s desire to protect their baby from drug side-effects by deciding to only take medications in pregnancy if absolutely required.

In this study, the online drug information sourced was used as confirmation or reassurance that it was “ok” or “not ok” to take medications by 46% of respondents. Lagan et al. (2011) reported that assisting decision-making was one of the main reasons why pregnant women accessed the Internet. Overall, the results from this survey demonstrated that women exercised extra caution about taking medications before and during pregnancy and 55% altered or reduced their intake. This corresponds with Nordeng, et al. (2010b) and Twigg et al. (2016) where women cited concerns for the safety of their baby as the primary reason for not taking medication. Peters et al. (2013) has reported that many Internet lists of medications safe for use during pregnancy provide inaccurate information, however, of the women surveyed here, 48% said that they had above average skills in their ability to evaluate the quality and validity of safety information found on the Internet.

Nordeng, et al. (2010a) reported that 79% of women had used medications during pregnancy with paracetamol being the most commonly used (59%), however, 43.4% believed all medicines were potentially harmful. Thorpe et al. (2013) report that, in the USA,
paracetamol and ibuprofen were the most common OTC medications taken in the first trimester. In comparison in our survey, only 19% of women reported that paracetamol was one of the medications that they would be happy to take during pregnancy, when asked an open question and 41% reported looking for information about analgesics suggesting some need for reassurance or information about safety. A multinational survey suggested that perception of risk of OTC medicines, such as paracetamol, was much lower than perceptions related to some other prescribed medications (Petersen et al., 2015). A recent online survey conducted in the UK also reported that women with back pain took analgesics including ibuprofen throughout their pregnancy (Sinclair et al., 2014), buying them over-the-counter despite official advice to take them in pregnancy only if prescribed by a doctor and to take paracetamol rather than ibuprofen in pregnancy where possible (NHS Choices, 2014). The risks associated with paracetamol are currently controversial (Bauer & Kriebel, 2013; Brandlistuen, Ystrom, Nulman, Koren, & Nordeng, 2013; Liew, Ritz, Rebordosa, Lee, & Olsen, 2014; Thiele, Kessler, Arck, Erhardt, & Tieg, 2013) but official sites advise it as a safe medication in pregnancy (NHS Choices, 2014). These findings point towards the need for greater education and awareness of OTC drug use during pregnancy.

In our survey 53% of women stated that they would be happier to take medicines during the third trimester of pregnancy than the first trimester and women are more likely to search for information in the first trimester (De Santis et al., 2010; Larsson, 2009). This is comparable with Zaki and Albarraq (2014) who reported that almost 100% of women stated that the first trimester was the critical time for foetal drug exposure. This suggests women correctly identify the first trimester as the critical time for structural birth defects, although the risks of foetal exposure also extend to other trimesters (Thomas & Yates, 2012).

Clemow et al. (2014) stated that healthcare professionals (HCP) and pregnant women routinely overestimate the teratogenic risks of medicines. This may be one reason why women in our survey said that doctors are reluctant or unwilling to prescribe medications during pregnancy, the other reason being the lack of evidence and readily available information about safety (Thorpe et al., 2013). This fact has been highlighted by the FDA and Health Canada and the FDA has revised its drug labelling policy to include the Pregnancy and Lactation Labelling Rule in June 2015 to ensure drug manufacturers provide information on product labels about safety for pregnant and lactating women (Mosley, Smith, & Dezan, 2015). The European Board and College of Obstetrics and Gynaecology (EBCOG) (Van Calsteren et al., 2016) and the European Institute of Women's Health have strongly urged the European Commission to follow suit about this.

Of the women who participated in the survey 40% (n=120) agreed that Internet pharmacies should ask if the purchaser is pregnant, however, Orizio et al. (2009) found that this was the case with only 70.2% (n = 40) of suppliers and a previous study of isotretinoin found that even for this highly teratogenic drug the online pharmacies did not routinely ask this question (Lagan et al., 2014). Of the women who had purchased medications on the Internet, 12 women (86%) had never or only sometimes been asked if they were pregnant and half had never been asked for a prescription. Illegal, counterfeit and recalled medications are widely available on the Internet often from seemingly legitimate sources (Alwon, Solomon, Hussain, & Wright, 2015; Mackey & Liang, 2011). The lack of knowledge reported by women in this study surrounding the requirements of genuine e-pharmacies poses serious concerns for pregnant women and their babies which would suggest greater consumer awareness is required (Alwon et al., 2015). Analyses of a sample of 120 online pharmacies by Mavlanova et al. (2012) highlighted that low-quality sellers displayed fewer of the high-cost signs that allow customers to easily verify their legitimacy than high-quality sellers do (Mavlanova, Benbunan-Fich, & Kourafis, 2012), therefore, increasing the potential for uncertainty among consumers. In an attempt to optimize maternal and foetal health professionals need to educate pregnant women about the health risks associated with taking non-prescribed medications during pregnancy and the dangers of purchasing medications online. Ideally this education should be provided in the preconception period.

### 4.1 Study limitations

Although the survey sample were designed to constitute a representative cross-sections of women living in the UK, the majority of
participants resided in England therefore the sample was not representative of women living in the UK as a whole. It also needs to be accounted for that in Scotland, Wales and Northern Ireland prescriptions are free to all citizens, whereas in England this is not the case. To achieve the sample size for the survey an online panel sample was used. Online panel samples are by definition, convenience samples. Even when their composition may resemble the general population, they are populated with individuals who want to participate in surveys in exchange for incentives. Although to complete the survey there was a stipulated inclusion and exclusion criteria it has to be highlighted that not all women who fulfilled these criteria would have had the same chance to participate in the survey as not all belong to an online panel. Participants who had given birth up to a year previously were included in this study and difficulties recollecting details about medication searching may have led to recall bias.

5 | CONCLUSIONS

This survey demonstrates that pregnant women are routinely using the Internet to access drug information and the primary reason for doing so is to ensure the safety of their baby. For pregnant women the Internet can be a convenient and easy accessible resource. Maternity health care providers need to be equipped with the knowledge to be able to direct women to a ‘one stop’ authoritative on line information resources about medication use and safety in pregnancy. However, they lack a single well known, authoritative online reference source about medication safety in pregnancy. The development of such a database would be invaluable for pregnant women and maternity healthcare providers alike.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE [http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html]):

- Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data.
- Drafting the article or revising it critically for important intellectual content.

CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

REFERENCES


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