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The outbreak of coronavirus disease in China: Risk perceptions, knowledge, and information sources among prenatal and postnatal women

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ABSTRACT

Background: The COVID-19 pandemic has created anxiety among members of the public, including all women over the childbirth continuum, who are considered to be at a greater risk of contracting most infectious diseases. Understanding the perspectives of health care consumers on COVID-19 will play a crucial role in the development of effective risk communication strategies. This study aimed to examine COVID-19-related risk perceptions, knowledge, and information sources among prenatal and postnatal Chinese women during the initial phase of the COVID-19 pandemic.
Methods: A cross-sectional survey design was adopted, and a four-section online questionnaire was used to collect data. Using a social media platform, the online survey was administered to 161 participants during the outbreak of COVID-19 in Nanjing, China, in February 2020.
Results: The participants perceived their risk of contracting and dying from COVID-19 to be lower than their risk of contracting influenza, however many of them were worried that they might contract COVID-19. The participants demonstrated adequate knowledge about COVID-19. The three major sources from which they obtained information about COVID-19 were doctors, nurses/midwives, and the television, and they placed a high level of confidence in these sources. There was no significant relationship between the perceived risk of contracting COVID-19 and knowledge about this disease.
Conclusion: The present findings offer valuable insights to healthcare professionals, including midwives, who serve on the frontline and provide care to pregnant women. Although the participants were adequately knowledgeable about COVID-19, they had misunderstood some of the recommendations of the World Health Organisation.

Statement of significance

Problem or issue

COVID-19 is a novel viral infection. Little is known about pregnant women's perceptions of and knowledge about this disease.

What is already known

COVID-19 is a novel viral disease, and health researchers are currently investigating its effects on pregnant women and their unborn children. There is limited evidence to support the claim that pregnant women are at a greater risk of contracting severe COVID-19. Further, there is no evidence to support the claim that mothers can transmit the disease to their foetuses. No past study has examined COVID-19-

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related risk perceptions, knowledge, and information sources among pregnant women.

What this study adds

The women who participated in this study perceived their risk of contracting and dying from COVID-19 to be lower than their risk of contracting influenza, however, they were worried that they or their family members might contract COVID-19. They demonstrated higher-than-average levels of knowledge about COVID-19. The source from which women most frequently acquired information about COVID-19 was doctors.

1. Introduction

Since the outbreak of the novel coronavirus disease (COVID-19), which was first reported in Wuhan, China, on December 31, 2019, there has been a steep increase in the numbers of confirmed cases, deaths, and affected countries [1]. According to the World Health Organisation (WHO), it took more than three months to reach the first 100,000 confirmed cases, 12 days to reach the next 100,000 cases, 4 days to reach 300,000 cases, and only 3 days to reach 400,000 cases [2]. The pandemic is accelerating at an alarming pace, and there is no sign of an end. Confirmed case fatality ratios (CFRs) vary significantly across countries. Regarding China, the Chinese Center for Disease Control and Prevention (CCDC) reported a CFR of 2.3% [3] in February, whereas the WHO reported a CFR of approximately 3.4% worldwide [4]. Although these two figures are lower than the CFR of 9.6% that was reported during the severe acute respiratory syndrome (SARS) outbreak in 2003 [5], the rapidly evolving COVID-19 situation has necessitated unprecedented lockdowns in many major cities in China and travel restrictions both to and from China to contain the outbreak. Despite these precautions, a massive number of confirmed cases has been reported both within China and internationally [6–8]. To curb the spread of COVID-19, many countries have issued countrywide lockdowns, which entail the suspension of nonessential businesses and enforcement of travel or border restrictions. Further, many airlines have cancelled their flights.

Because of the uncertainty surrounding the progress and rapid spread of the disease, the outbreak has inevitably elicited an automatic and a subconscious fear of infection [9,10]. A perceived sense of immediate risk causes significant psychological unrest in individuals and leads them to adopt preventive measures. A research study conducted in Hong Kong found that 98.0% of 1168 unaffected participants felt anxious about COVID-19, with many (88.0%) of them believed that they may eventually be diagnosed with the disease [11]. Similar findings were reported in Hong Kong during the SARS outbreak in 2003. Whilst a survey conducted among 980 pregnant women during the SARS outbreak found that they possessed adequate knowledge about SARS, most of them were worried about contracting the disease and, consequently, transmitting it to their foetuses [12].

Knowledge has been found to be negatively related to perceived risk. In their survey on 166 senior adults in Las Vegas, Maes and Louis found that the perceived risk of contracting acquired immunodeficiency syndrome (AIDS) was negatively associated with knowledge about AIDS [13]. A cross-sectional study, which investigated 429 nursing students' preventive behaviour against Middle East respiratory syndrome (MERS) in Korea, found that, although knowledge was important, attitudes and risk perceptions had the most significant effects on preventive behaviours against MERS [14]. In a survey conducted by Mak and Lai, only 28.1% of the

participants (288 Hong Kong secondary school students) demonstrated adequate knowledge about H1N1 transmission, and more than half of them perceived the risk of contracting H1N1 infection to be high [15]. However, in two other studies, the perceived risk of contracting H1N1 infection was unrelated to knowledge about this disease [16,17]. Taglioni et al. conducted a cross-sectional survey on 725 Reunion Island inhabitants during the influenza A (H1N1) pandemic in 2010 and found that the perceived risk of contracting H1N1 infection was positively associated with precautionary behaviours but not knowledge about H1N1 infection [16]. Another cross-sectional study examined the relationship between knowledge, anxiety, and the perceived risk of contracting H1N1 infection among 235 Scottish undergraduate students. They possessed low levels of knowledge about H1N1 infection, but there was no relationship between knowledge and the perceived risk of contracting H1N1 infection [17]. A similar trend was observed in an online survey, which was conducted on 500 Dutch people during the 2003 SARS outbreak [18]. Although knowledge about SARS was positively associated with worry about SARS as a health problem, there was no association between knowledge and the perceived risk of contracting SARS [18]. It should be noted that these studies were not specific to pregnant women.

Because the COVID-19 pandemic is still in its early stage the provision of accurate information has been difficult to obtain, even for healthcare professionals. What is known is that according to Chuang, it is important to ensure the credibility and accessibility of information about COVID-19 [19]. The development of information technology has increased the number of sources from which the general public can obtain health information about a pandemic. For example, the internet and social media have increased the speed and volume of information exchange worldwide [20]. Reliable open communication channels can help the general public detect spurious or misleading information [19]. Failure to do so can amplify risk perceptions amid an evolving pandemic [21–23]. Chuang has noted that healthcare professionals play a key role in risk communication by providing accurate information [19].

According to the WHO and CCDC, more than 80% of those with COVID-19 experience only mild symptoms and eventually recover from the disease. However, approximately 20% of them have severe or critical disease. Their symptoms range from shortness of breath to septic shock and multi-organ failure. Two percent of reported cases will die from the disease. Older adults and those with underlying health conditions are at a greater risk of contracting the disease [1,6]. There have been relatively few paediatric cases, and the number of pregnant women who have contracted the disease remains unknown. Some studies about pregnant women were conducted at the beginning of the outbreak and included very small samples. Chen and colleagues conducted a study among nine patients and found that there was no difference in the symptoms of COVID-19 between pregnant and nonpregnant women [24]. They also found no evidence of transplacental transmission from mothers to neonates. They also observed that pregnancy does not appear to increase the risk of death due to COVID-19 [24]. Two other studies have also reported similar findings [25,26]. The Centers for Disease Control and Prevention (CDC) in the United States (US) reported that the risk of infection does not seem to differ between pregnant and nonpregnant women [25]. However, since pregnant women undergo many physical changes, which may increase their risk of contracting certain infections, the CDC has urged pregnant women to stay away from those who are sick and those who are in close contact with someone who has been diagnosed with COVID-19 [25]. Yu et al. treated seven pregnant women with COVID-19 and reported that all the participating mothers and their infants demonstrated good outcomes. All the participating mothers were in their third trimester and had mild symptoms. However, the impact of COVID-19 on the foetus during

other trimesters and in mothers with moderate to severe symptoms remains unknown. The authors suggest that future studies should undertake long-term follow-up investigations among mothers with a confirmed diagnosis and their neonates to understand the effects of COVID-19 on pregnant women and their children [26]. These findings from the studies described above may alleviate some of the anxiety that pregnant women experience but further research is required to understand what they gathered from their various sources, what they understood, where they got their information from and how accurate it was. To this end the purpose of the study was to examine COVID-19 related risk perceptions, knowledge and information sources among prenatal and postnatal Chinese women.

2. Methods

A cross-sectional survey design was used to examine COVID-19-related risk perceptions, knowledge, and information sources among Chinese pregnant women and women immediately following childbirth. Women who could read and write Chinese, were willing to participate in this study, and were pregnant or had given birth within the past six weeks were eligible for inclusion. An electronic questionnaire was used, and it consisted of four sections, which assessed the following: (a) demographic characteristics, (b) risk perceptions, (c) knowledge about COVID-19, and (d) information sources. Regarding demographic characteristics, their age, gestational age, educational level, occupation, place of usual residence, the experience of complications during pregnancy, and the presence of chronic diseases prior to pregnancy were assessed.

The 8-item Risk Perceptions Section was developed by the research team, following a review of the literature on the concept of perceived risk [12,18,27–32]. The participants were asked to estimate their risk of contracting and dying from COVID-19 and other diseases or adverse accidents. They were also asked to indicate the extent to which they were worried about contracting COVID-19, their family members contracting COVID-19, the spread of COVID-19 to the areas in which they lived, and the likelihood of others contracting COVID-19. Responses were recorded on a five-point scale, which ranged from 1 (very unlikely) to 5 (very likely).

The first author developed the Knowledge Section in accordance with the information that the WHO has published on their *Advice for Public* webpage [1]. Twenty-one questions were developed to assess knowledge about how masks should be worn and the myths that are related to COVID-19. Four out of the 21 questions assessed knowledge about COVID-19 in relation to pregnancy. Their responses were scored as follows: correct answer = 2, not sure = 1, and incorrect answer = 0.

Finally, the Information Sources Section was also developed by the research team, following a review of publications on different information sources [33–38]. The participants were asked to indicate the sources from which they obtained information about COVID-19 and their level of confidence in these sources. This section consisted of eight items. Responses were recorded on a five-point scale, which ranged from 1 (very little) to 5 (very much).

The content validity of the questionnaire was examined by two scholars who were experts in maternity nursing and infection control. The questionnaire was revised based on their feedback. The internal consistency of the four sections was high (Cronbach's α = 0.81–0.95).

2.1. Data collection

This study was approved by the Ethics Review Board of Sir Run Run Hospital of Nanjing Medical University, Nanjing, Jiangsu, China (Approval number: 2020-SR-005). Nanjing is located approximately 658 km northeast of Wuhan (the epicentre of the outbreak), and it takes about six hours of driving from Nanjing to Wuhan. In February 2020, the questionnaire was electronically distributed to the participants using WeChat. WeChat is an all-in-one messaging application and the most popular social media platform in China. Nurses approached potential participants who were visiting the maternity units for a regular checkup. They were assured that participation in the study was voluntary and that refusal to participate or withdrawal from the study would not result in any penalties or the loss of benefits to which they would otherwise be entitled. Subsequently, the participants were provided with instructions on how to complete and submit the online questionnaire. They were also informed that clicking the final "Submit" button would serve as an affirmation of their consent to participate in the study. The first page of the online survey described the purpose of the study and what they would be required to do. To protect the privacy and confidentiality of the participants, personal information (e.g., names, addresses, and phone numbers) was not collected. Access to the submitted responses was restricted to the research team by requiring the user to enter a username and password to login.

2.2. Analysis

Data cleaning was undertaken prior to data analysis. Descriptive statistics (means, SDs, and frequencies) were computed to examine participant characteristics and the study variables (risk perceptions, knowledge, and information sources). Inferential statistical analyses (correlation analysis, t-test, and chi-squared analysis) were conducted to examine group differences and relationships among the study variables. All statistical analyses were conducted using Statistical Package for the Social Sciences version 26.0. The level of significance was set as α = 0.05.

3. Results

3.1. Participants

The response rate was approximately 75%, and 161 women participated in this study. Among the 161 women, 82.2% were

Table 1
Perceived risk of contracting COVID-19 and experiencing other adverse events.

Item	Mean	Very unlikely (%)	Unlikely (%)	Neutral (%)	Likely (%)	Very likely (%)
1. Influenza	3.32	8.6	7.3	45.7	31.3	7.3
2. H1N1	2.42	18.7	31.3	41.3	8.7	0
3. COVID-19	2.34	18.4	28.9	45.4	6.6	0.7
4. Traffic accident	2.21	27.3	27.3	43.3	2.0	0
5. Home accident	2.16	28.7	28.7	40.7	2.0	0
6. Food poisoning	2.12	28.7	34.7	34.0	2.7	0
7. Cancer	2.04	32.9	34.9	29.5	2.7	0
8. Heart attack	1.89	40.0	32.7	26.0	1.3	0

pregnant, and the rest had given birth within the past six weeks. Their mean age was 29.55 ± 3.82 years (range = 21–39). Almost all of them reported that they had not experienced any complications during pregnancy (91.8%) or chronic diseases before pregnancy (94.5%). Most of them held an undergraduate degree (79.6%) and were living in Nanjing (65%) or a place close to Nanjing. Regarding their occupations, 59%, 14.3%, 12.7%, 7.5%, and 6.5% of them were office workers, housewives, healthcare workers, teachers, and self-employed women, respectively.

3.2. Perceived risk

The total perceived risk scores ranged from 8 to 32 (Mean = 18.24, SD = 5.48). The perceived risk of contracting COVID-19 was lower than the perceived risk of contracting influenza and H1N1 infection but higher than the perceived risk of experiencing other adverse events (e.g., accidents, food poisoning, cancer, and heart attack) (Table 1). The perceived risk of dying from COVID-19 was lower than the perceived risk of dying from influenza but higher than the perceived risk of dying from other adverse events (Table 2).

In addition, 37.7% of the participants reported that they were worried about contracting COVID-19. Moreover, 45.7% of them were concerned about their family members contracting COVID-19. Further, more than half of them were worried about the spread of COVID-19 to the areas in which they resided.

3.3. Knowledge about COVID-19

The rate at which correct answers were provided to the 17 items that assessed knowledge about COVID-19 was 76.4%. The total scores ranged from 15 to 33 (Mean = 25.99, SD = 3.75). The rate at which correct answers were provided to the four items that pertained specifically to pregnancy was 77.5% (range = 3–8, Mean = 6.20, SD = 1.05) (Table 3).

3.4. Information sources

The three major sources from which the participants obtained information about COVID-19 were physicians (Mean = 4.22), nurses/midwives (Mean = 4.15), and the television (Mean = 4.14). Their level of confidence in these three sources was also higher than their level of confidence in other information sources (Table 4).

3.5. Correlations

No significant correlation emerged between demographic characteristics and the three study variables, namely, perceived risk, knowledge, and information sources. Further, intercorrelations among these three study variables were not significant.

4. Discussion

This study examined COVID-19-related risk perceptions, knowledge, and information sources among prenatal and postnatal Chinese women. The data were collected from the residents of a city that had been locked down in February 2020 following the outbreak of COVID-19 in China. Given that the disease continues to rapidly spread throughout China and around the world [1], it was surprising to find that 47.3% of the participants considered it unlikely or very unlikely that they would contract COVID-19 (Table 1). This finding is inconsistent with the statistics that have been reported for Hong Kong; specifically, 88% of the participants believed that they were at risk of contracting the disease [11]. Equally, this observation contradicts the findings of Ng et al.'s study, conducted among 980 pregnant Chinese women during the 2003 SARS outbreak in Hong Kong. Specifically, 71.4% of their respondents perceived their risk of infection to be high, and 89% of them believed that there was a high risk that their foetuses would contract SARS [12]. However, many of them were worried that they (37.7%) or their family members (45.7%) might contract COVID-19 soon. Although there were 8,051 confirmed cases in Jiangsu, no deaths were reported during the data collection period [4]. The low mortality rate and high recovery rate may have led them to believe that they were very unlikely to contract and die from COVID-19 [1]. This finding may also be attributable to the fact that the participants were relatively young, did not have preexisting health conditions, and had not experienced pregnancy complications. According to the WHO, young and healthy individuals are unlikely to fall so critically ill that they eventually die [1]. The participants were not COVID-19 patients. Further, as instructed by the Chinese government, they had been confined to their homes. Therefore, they may have felt relatively safe. Another reason is cultural taboos. The subject of death is a huge taboo in China. Chinese people refrain from openly discussing issues related to death in public. They believe that doing so will ward off death and ghosts from their lives. Therefore, they may refrain from talking about dying from COVID-19 to ensure that the disease does not affect them [30].

It is understandable that the participants of this study perceived their risk of contracting influenza to be greater than their risk of contracting COVID-19 (Table 1), as the CDC has reported that there have been 9–45 million infected cases, 140,000–810,000 hospitalizations, and 12,000–61,000 deaths annually since 2010 [3]. In our study almost 3 times as many participants believed that they were likely or very likely to die from influenza than from COVID-19 (Table 2), demonstrating that their beliefs reflected the true statistics as published by the CDC.

The participants of this study possessed relatively high levels of knowledge about COVID-19 (rate of correct responding: 76.4%). The correct answer to the first item that assessed knowledge ("If you are healthy, you need to wear a mask only if you are taking care of a person with suspected COVID-19.") was "No" because Chinese officials have been urging the public to wear masks to prevent the

Table 2
Perceived risk of death due to COVID-19 and other adverse events.

Item	Mean	Very unlikely (%)	Unlikely (%)	Neutral (%)	Likely (%)	Very likely (%)
1. Influenza	2.01	39.6	29.5	22.8	6.7	1.3
2. COVID-19	1.99	35.3	33.3	28.7	2.7	0
3. Traffic accident	1.98	36.5	31.3	29.7	2.7	0
4. Home accident	1.96	37.8	31.8	27.7	2.0	0.7
5. H1N1	1.93	37.2	35.1	25.7	2.0	0
6. Food poisoning	1.91	38.5	34.5	25.0	2.0	0
7. Cancer	1.84	42.6	32.4	23.6	1.4	0
8. Heart attack	1.78	45.3	33.1	20.3	1.4	0

Table 3
Items used to assess knowledge about COVID-19.

Item	Yes (%)	No (%)	Not sure (%)
1. If you are healthy, you need to wear a mask only if you are taking care of a person with suspected COVID-19.	9.1	90.9[a]	0
2. You should wear a mask if you have been coughing or sneezing.	82.3[a]	14.5	3.2
3. Masks are effective only when you frequently clean your hands with alcohol-based hand sanitiser or soap and water.	47.6[a]	46.8	5.6
4. Before wearing a mask, you should clean your hands with alcohol-based hand sanitiser or soap and water.	99.2[a]	0.8	0
5. You should cover your mouth and nose with a mask and make sure that there are no gaps between your face and the mask.	97.6[a]	1.6	0.8
6. You should avoid touching the mask while using it; if you do end up touching the mask, you should clean your hands with alcohol-based hand sanitiser or soap and water.	98.4[a]	1.6	0
7. You should replace a mask with a new one as soon as it becomes damp, and you should not reuse single-use masks.	98.4[a]	0.8	0.8
8. You should remove the mask from behind (i.e., you should not touch the front of mask). You should immediately discard the used mask in a closed bin and clean your hands with alcohol-based hand sanitiser or soap and water.	97.6[a]	2.4	0
9. Ultraviolet lamps should be used to sterilise hands or other areas of the skin.	29.8	52.4[a]	17.7
10. Thermal scanners can detect those who have not developed a fever.	34.7	52.4[a]	12.9
11. Spraying alcohol or chlorine all over your body will kill the novel coronavirus.	27.4	58.9[a]	13.7
12. It is safe to receive a letter or package within China.	26.6[a]	50.0	23.4
13. Pets (dogs or cats) can spread COVID-19.	19.4	45.2[a]	35.5
14. Vaccines against pneumonia can protect you from COVID-19.	8.9	74.2[a]	16.9
15. Eating garlic can protect you from COVID-19.	3.2	81.5[a]	15.3
16. Antibiotics are effective in preventing and treating COVID-19.	13.7	54.0[a]	32.3
17. Currently, there are specific medicines that can be used to prevent or treat COVID-19.	12.1	58.9[a]	29.0
18. The vertical transmission of COVID-19 from a pregnant woman to her foetus has been confirmed.	39.5	18.5[a]	41.9
19. Pregnant women are more susceptible to COVID-19 than the general population.	83.1[a]	4.0	12.9
20. The neonates of pregnant women with suspected or confirmed COVID-19 should be isolated in a designated unit for at least 14 days after birth.	85.5[a]	4.8	9.7
21. Women with suspected or confirmed COVID-19 can breastfeed their neonates.	3.2[a]	80.6	16.1

[a] Correct response.

Table 4
Mean reliance and confidence scores for different sources of information about COVID-19.

Source	Reliance	Confidence
1. Physicians	4.22	4.22
2. Nurses/midwives	4.15	4.14
3. Television	4.14	4.14
4. Radio	3.84	3.85
5. Weibo	3.52	3.56
6. Internet	3.48	3.49
7. Family and friends	3.45	3.49
8. WeChat	3.30	3.41

spread of COVID-19 [8,21]. Similarly, Brug et al. conducted a study in the Netherlands and found that 83.9% of the participants obtained accuracy rates that were higher than 75% on a measure of their knowledge about SARS [18]. Vartti et al. examined knowledge about SARS among the general public in Finland and the Netherlands, which were unaffected countries [18]. Slightly more than half of the participants in these two countries possessed reasonable levels of knowledge about SARS [28]. The pregnant women who participated in Ng et al.'s study demonstrated adequate levels of knowledge about SARS [12]. It appears that people obtain the required information about a contagious disease during the outbreak. Although the participants of this study possessed adequate knowledge about COVID-19, they did not provide the correct answers to several items. For example, only 47.6% of them were aware that masks are effective only when the wearer also frequently cleans his or her hands with alcohol-based hand sanitiser or soap and water (Table 2). Similarly, 29.8% of them were unaware that ultraviolet lamps should not be used to sterilise hands or other areas of the skin. Moreover, 34.7% of them did not know that thermal scanners cannot detect individuals who have not developed a fever. Furthermore, many women were unsure about the effectiveness of antibiotics in preventing and treating COVID-19 and the existence of specific medicines that can be used to prevent or treat this disease.

The rate at which the participants provided correct responses to the 4 items that assessed knowledge about COVID-19 in relation to pregnancy was relatively high (rate of correct responding: 77.5%). This finding may be attributable to the fact that they primarily obtained information about COVID-19 from physicians, nurses and midwives, who are credible information sources. Nevertheless, many participants were unsure about the possibility of the vertical transmission of COVID-19, and 81.3% of them believed that pregnant women are more susceptible to COVID-19 than the general population (Table 3). The literature on the effects of COVID-19 on pregnant women and their children is limited. The CDC in the US reported that severe acute respiratory syndrome coronavirus 2 was not found in the amniotic fluid, placenta, or breast milk of pregnant women with COVID-19 whom they had tested and that their babies had not contracted the disease [25]. In addition, there is insufficient evidence to support the claim that pregnant women are at a greater risk of contracting COVID-19 than the general public [24–27]. Further, there is a lack of empirical evidence regarding the possibility of the transplacental transmission of COVID-19 from mothers to foetuses [24–26]. In one study, women who had contracted COVID-19 during their third trimester experienced only mild symptoms [26]. However, COVID-19 is a novel viral infection, and much remains unknown about its impact on pregnancy; therefore, further investigation is needed [25].

The participants of this study obtained information about COVID-19 from various sources. However, fewer women relied on social media, family members, and friends for information, and they placed lower levels of confidence in these sources. Physicians, nurses/midwives, and the television were the sources upon which they most frequently relied, and they placed greater confidence in them. It is not surprising that the preferred source of information about COVID-19 was doctors and that their confidence in doctors ranked the highest among the various sources of information. Medicine is a well-respected profession in China. Further, Chinese people look up to authority figures, consider them to be trustworthy, and are inclined to accept their advice [32]. Similar to the present findings, Vartti et al. found that Finns trusted the information that they had received from official sources during the SARS outbreak [28]. With regard to influenza, past studies have

found that healthcare workers and service providers tend to be perceived as the most trusted sources of information during a pandemic [35,36]. Therefore, healthcare professionals should actively disseminate meaningful, relevant, and accurate information during a pandemic.

Facebook, Twitter, Instagram, and other social media platforms, which are popular in Western countries, are generally inaccessible to the Chinese population. Consequently, WeChat and Weibo have emerged as the most widely used social media platforms in China. During the last quarter of 2019, WeChat had more than 1.16 billion monthly active users. The age of their users is distributed quite evenly across the range of 19–45 years [37]. Weibo gained 17 million monthly active users during the last quarter of 2019 [38]. Both these applications can provide real-time information. However, plenty of misinformation and rumours about COVID-19 were rapidly spreading through these platforms, and this created unnecessary panic [20]. Limaye et al. contended that social media platforms facilitate the spread of misinformation about COVID-19 [36]. In this regard, it was reassuring to find that the participants of this study relied on WeChat and Weibo less frequently than they relied on other information sources.

Effective means of providing accurate information about COVID-19 to the general public are needed. It is important for healthcare professionals to communicate with the public in general and pregnant women specifically. Choosing credible information sources is the best means of ensuring that one acquires accurate information [9]. Vartti et al. conducted a study, which focused on SARS, and concluded that listening to the general public and understanding their needs play a very important role in facilitating effective two-way communication [5]. Therefore, using vocabulary that the general public can easily read and understand and increasing the number of health information sources that are available to the public (i.e., information that is communicated using simple language) will increase their awareness. Conducting open forum discussions or face-to-face workshops led by healthcare professionals, especially COVID-19 experts, will be effective in alleviating anxiety among the general public. Thus, the public should rely on trusted, traditional, and credible information sources such as the WHO or the CDC in the US.

Contrary to our predictions, perceived risk was unrelated to knowledge about COVID-19 in this study. At present, there is no published article on the relationship between these two variables among pregnant women. However, the studies that were conducted among the general population during the SARS and MERS outbreaks yielded similar results [14,18]. For example, Brug et al. conducted a study in the Netherlands and found that knowledge about SARS was positively associated with worry but unrelated to the perceived risk of contracting SARS during the SARS outbreak [18]. Thus, perceived risk may motivate individuals to take precautionary actions [16], but its impact on knowledge has not been adequately delineated [14].

Our study has several limitations. First, the data were collected during mid-February 2020, when the number of confirmed cases was less than 80,000 globally [1]. Thus, the results of this study may not be applicable during the more advanced phases of the pandemic. Further research is needed before the findings can be generalised. Indeed, the number of COVID-19 cases continues to rise in China and around the world. Second, our participants were not representative of the Chinese population of childbearing women because data were collected only within Nanjing and its surrounding regions. Further research is needed to determine whether the present findings can be generalised to the wider population of childbearing women in China and in other countries. In addition, the instruments were tested among Chinese participants, and cultural taboos may have influenced the results. The validity of the instruments that were used in this study should be further examined before they are used with samples drawn from other populations.

Despite these limitations, our study offers important implications for practice. The present findings will serve as useful information to midwives when they provide care to pregnant women. Midwives are the most credible information source and direct care providers. They should acquire and disseminate up-to-date and accurate information and follow all the recommendations of health authorities. They may also correct misleading information regarding transmission and prevention of COVID-19, as well as pregnancy-specific risk of infection. Moreover, midwives are well positioned to educate pregnant women about safe care of a neonate during the pandemic such as breastfeeding and daily hygiene.

5. Conclusion

In this study, primary data were collected from the residents of a city that is not far from Wuhan. This facilitates the exchange of knowledge between researchers in China and other countries. In this study, pregnant women perceived their risk of contracting COVID-19 to be higher than their risk of contracting other health conditions except influenza. They were worried that they or their family members might contract COVID-19. They possessed adequate knowledge about COVID-19. Doctors, nurses, and the television were the three major sources from which they obtained information about COVID-19, and they placed high levels of confidence in these sources. Therefore, open forum discussions or face-to-face workshops led by healthcare professionals should be conducted to ensure that accurate and up-to-date information is provided to pregnant women.

Consent

Participants verbally agreed to participate in the study.

Ethical statement

The study was approved by the Ethics Review Board of the Sir Run Run Hospital, Nanjing Medical University, Nanjing, China on March 9, 2020. Number: 2020-SR-005.

Competing interests

None declared.

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