

Characteristics of online medical care consultation for pregnant women during the COVID-19 outbreak: a cross-sectional study

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Abstract

Background During the Coronavirus Disease 2019 (COVID-19) outbreak, emergency traffic bans limited accessibility of some medical resource for pregnant women. Fear of viral transmission also prevented pregnant women from seeking routine antenatal care (ANC). This study described the needs of pregnant women and the contents of online obstetric consultation in representative areas with various severity of the epidemic in China. **Methods** From February 10th to 23rd, we collected data on online obstetric consultations and women's satisfaction in mild, moderate and severe epidemic areas through an e-health provider's platform. Information on women's needs, contents of the consultation and satisfaction were collected and compared by epidemic areas. **Results** A total of 2599 pregnant women participated in this study, of whom 448, 1322 and 819 women were from the mild, moderate and severe epidemic areas, respectively. The distributions of the amount of online consultation were significantly different not only in different areas, but also in different trimesters. The more severe the epidemic was and the more advanced the pregnancy was, the higher the amount of second category (changed their schedules of ANC and/or delivery as well as method of delivery) was. 957 participants completed a satisfaction survey. For most of the participants, it's their first time to use the e-health, and nearly 90% participants were completely or mostly satisfied with the online consultation. **Conclusions** Our study found that during the outbreak, many pregnant women had changed their scheduled ANC visits without authorization, and the more serious the epidemic was, the more common it occurred. The needs for online consultation was substantial. In order to prevent irreversible obstetric adverse events, an appropriate ANC contingency plan with e-health services is highly recommended during the Public Health Emergency of International Concern (PHEIC).

Background

Since December 2019, a number of unexplained cases of viral pneumonia have been found in Wuhan, Hubei province.^[1] By January 7, 2020, Chinese scientists had isolated the novel coronavirus, which has been later termed as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The official name of the related disease is COVID-19.^[2] According to the data before January 23, 2020, the estimated COVID-19 R_0 value was 2.2–3.8.^{[3]–[5]} Since 10 a.m. on January 23, 2020, traffic bans in Wuhan has been established and the whole city has been temporarily locked down.^[6] Subsequently, first-level emergency responses to public health emergencies have been launched successively throughout China. As of April 8, 2020, the number of confirmed cases of COVID-19 globally reached 1,384,146, of which 83,157 cases were confirmed in China, especially in Hubei province (67,803 confirmed cases). Pregnant women are considered to be susceptible to this virus^[7]. Once Pregnant women are suspected or diagnosed with COVID-19, pregnancy and childbirth would become complicated and challenging.

E-health refers to the integration of medical services and medical information through the Internet and mobile technologies, such as computers, mobile phones, handheld tablets, and other wireless devices.^[8, 9] Compared with developed countries, e-health started relatively late in China.^[10, 11] Previous reports have

shown that the number of mobile phone users worldwide is nearly 7.7 billion, which equals to the total population in the world.^[12] By June 2019, only 5.27% internet users had used the “Internet + medical” (45 million).^[13] The YueYiTong (YueYiTong Science and Technology Co., Ltd. in Chongqing, China) has set up an online communication platform for hospitals and pregnant women specially. Currently, it has been applied in many domestic comprehensive medical institutions to provide health consultation and online services for the pregnant women. So far, it has 54,303 registered users. During the COVID-19 outbreak, an online medical model that allows pregnant women to consult professional obstetricians without leaving home has been rapidly developed by YunYiTong (YYT, a platform built by YueYiTong)

For pregnant women, the routine ANC during pregnancy is very important, by which high-risk pregnant women can be screened as soon as possible^[14, 15]. However, the maternal ANC encountered great challenges during the COVID-19 outbreak due to limited accessibility of some medical resource caused by emergency traffic bans, and the risk of viral transmission. In this study, we focused on the specific content of online obstetric consultation for pregnant women during the COVID-19 outbreak based on the platform (YYT). To further investigate the role of e-health, we also conducted a survey on pregnant women who consulted online to understand their satisfaction with this consultation service and their future needs for e-health .

Methods

Study design and participants

This study was a descriptive, cross-sectional study. We collected data from two aspects including contents of pregnant women's online obstetric consultation and satisfaction. Gestational age and satisfaction survey were collected from registration information and satisfaction questionnaire, respectively. The content of satisfaction questionnaire was reviewed by obstetricians (Hongbo Qi and Xin Luo). Several ways were performed to promote the free online service for obstetric consultation provided by YYT, including forwarding the link of the online medical consultation service website to colleagues and friends and distributing the free online treatment information. Within a few days after it was launched, the free online treatment mode had attracted over 800 maternal-fetal medicine specialists in 347 hospitals nationwide. Every pregnant woman had access to the free online treatment after registration on the platform, and can choose obstetricians or hospitals at will. When a patient consults a doctor, the platform will prompt the doctor to reply within 24 hours. Before the consultation, the pregnant women would be informed that the contents of consultation would be used for scientific research and the platform promised that the contents would be kept absolutely confidential. After the consultation, the platform would distribute a satisfaction questionnaire, which would take 2 minutes to complete, but pregnant women could choose whether to answer or not. The study started from February 10, 2020 to February 23, 2020.

All pregnant women, who had submitted their online obstetric consultation, were eligible for inclusion. The cross-sectional study was approved by the ethics committee of the First Affiliated Hospital of

Procedures

According to the map of national COVID-19 confirmed cases and the data we collected from each province, Xinjiang, Gansu (10-99 confirmed cases), Chongqing (100-999 confirmed cases), Hubei, Henan, and Hunan (≥ 1000 confirmed cases) were chosen as representative areas (Figure 1 and Figure 2). In this study, the number of confirmed cases of COVID-19 in different areas was used to assess the severity of epidemics. Hence, according to the confirmed cases, Hubei, Henan and Hunan were defined as the severe epidemic areas. Chongqing was defined as the moderate epidemic area for more confirmed cases than Xinjiang and Gansu (the mild epidemic areas).

Data collection were conducted automatically and all data in our study were reviewed and classified independently by two authors (MMC and XYL). The data was sorted by different areas or different trimesters of pregnancy using manual classification method after the exclusion of unqualified data. The specific process of exclusion was shown in Figure 3.

According to gestational age, participants in each representative area were divided into three gestational periods: (1) the first trimester: < 14 weeks, (2) the second trimester: from 14 weeks to 27 weeks and 6 days, (3) the third trimester: ≥ 28 weeks. At the same time, contents of online obstetric consultations were then subdivided into five primary categories: (1) Routine antenatal check-up (reports of examination, appointments for antenatal check-up, method and time of delivery, and hospitalization process); (2) Obstetric care-seeking behaviour (cancel or postpone scheduled ANC visits; change method or time of delivery); (3) Abnormal symptoms (vaginal bleeding, abnormal fetal movement, abdominal pain, etc.); (4) Maternal comorbidity and pregnancy complication (gestational diabetes mellitus, hypertension disorders, hypothyroidism, etc.); (5) Other needs of e-health (remote fetal heart monitoring, electronic prescription, online pharmacies).

Since the satisfaction questionnaire was not a commonly structured scale, all the 7 questions have been analyzed separately. The questionnaire is shown in Appendix 1. Through the satisfaction questionnaire, we intend to understand the “4P” situation during the COVID-19 outbreak in different areas: (1) Percentage of users who use e-health for the first time; (2) Proportion of problems solved by YYT; (3) Pregnant women’s satisfaction with e-health; (4) Preference to e-health vs outpatient visits during and after the outbreak of COVID-19 outbreak.

Statistical analysis

All exact numbers and percentages for all variables were calculated, and all the comparisons were performed using Chi-squared test. The SPSS software, version 24.0 was used for the statistics analysis, and the conventional p value less than 0.05 is defined as statistically significant. Percentage (%) was used to express categorical variable.

Result

A total of 2599 participants participated in this study, of whom 448, 1322 and 819 women were from the mild, moderate and severe epidemic areas, respectively. Among all the participants, 417, 1054 and 1128 were in their first, second and third trimester of pregnancy, respectively. It was worth noting that it was the first time e-health was used in perinatal health care during the COVID-19 outbreak, and 6.77% of participants generated additional requirements for e-health, such as: remote fetal heart rate monitoring, electronic prescription, online pharmacies.

Reasons for online consultation by areas with different severity of the epidemic (Table 1).

The distribution of the amount of online consultation varied by areas with different severity of the epidemic ($p < 0.01$). And there was 32.48% of pregnant women consulted the second category (obstetric care-seeking behaviour) in the most severe areas, which was significantly higher than the average value of 22.58%.

Reasons for online consultation by trimesters of pregnancy (Table 2).

The difference was shown in the distribution of the amount of online consultation by trimesters ($p < 0.05$). This difference might be related to the distribution of the amount of online consultation on the first two categories. The first category (routine antenatal check-up) was of highest concern in the first trimester (57.31%), compared to that in the second (39.75%) and third trimester (31.03%). While the distribution of the amount of online consultation on the second category in different trimester was completely opposite to that on the first category. And the second category had attracted the most attention from pregnant women in the third trimester (25.18%) .

Reasons for online consultation by the trimesters of gestation and the severity of the epidemic (Table 3).

In this study, most participants were in the second or third trimester (40.55%, 43.40%). Therefore, the data of the first trimester had certain limitations in this study. Regardless of the trimesters, the distribution of the amount of online consultation was region-dependent ($p < 0.05$). In any trimester, the more severe the epidemic in different regions became, the greater the amount of consultations on the second category (obstetric care-seeking behaviour) would be. And the proportions of the second category in the second and third trimesters were 36.51% and 37.88% separately, while the corresponding average values were 24.38% and 25.18%.

The most concerned category during different trimesters (Fig. 4).

Generally, in any area, or during any trimester, routine antenatal check-up, obstetric care-seeking behaviour, and abnormal symptoms were the top three consulted categories. In the first trimester, pregnant women in different regions were the most frequently consulting for the first type of problems, which was consistent with that in the second and third trimester both in the moderate and mild epidemic

areas. However, in the severe epidemic areas, the second category (Obstetric care-seeking behavior) was of most concern in the second and third trimesters of pregnancy.

Participants experience with e-health (Table 4).

A total of 957 participants completed the satisfaction questionnaire, of whom 164,644,149 were from the mild, moderate and severe epidemic areas respectively. During the outbreak of COVID-19, we wanted to learn the following four aspects of the situation in different regions ("4P") from the questionnaire. The first is the percentage of users who use e-health for the first time. Surprisingly, for most of the participants, it was their first time to use the e-health, with the highest rate of 89.26% in the severely epidemic areas. The second is proportion of problems solved by the platform. We found that more than 90% of online consultation issues were completely or partially resolved. The third is pregnant women's satisfaction with e-health. In fact, the proportion of total satisfaction or relative satisfaction was the lowest in severe epidemic areas, at 87.92%, while it was as high as 90% in other areas. The last was Preference to e-health or outpatient visits during and after the outbreak. Undoubtedly, the outbreak of COVID-19 had an obvious impact on participants' choices. During the outbreak of COVID-19, most participants preferred to use e-health (the lowest rate of 88.41% in the mild epidemic areas), while, about half of participants chose the outpatient visits after the outbreak, which was most popular in moderate epidemic areas, with the highest rate of 62.11%. The advantages of e-health are saving time and reducing the risk of viral transmission. As for their suggestions for e-health in the near future, most pregnant women hoped that the platform would automatically recommend the most suitable obstetrician based on their consultations. Some participants expressed more needs for e-health, such as remote fetal heart monitoring, electronic prescription, and online pharmacies, etc..

Discussion

The COVID-19 outbreak represents a significant and urgent threat to global health. On 30 January 2020, COVID-19 has been declared as "public enemy number one" and "a very high level of global risk" by WHO. [16, 17] As of March 23, 186 countries worldwide had reported confirmed COVID-19 cases, including more than 10,000 confirmed cases in America, Germany, France, Italy and Iran. In this study, many pregnant women were found postponing or canceling their scheduled ANC visits on their own, which was related to the severity of the epidemic situation in different areas, especially in the severe epidemic areas. Meanwhile, the needs of pregnant women for e-health have exceeded our expectation. Data showed that more than 15,000 consultations were conducted through the platform till March 15. To the best of our knowledge, this is the first time to focus on the characteristics of online obstetric consultation for pregnant women during the COVID-19 outbreak.

Changes in obstetric care-seeking behaviour during the COVID-19 outbreak.

In our study, we discussed the associations between the distribution of the amount of online consultation and trimesters or the severity of the epidemic in different area. The distribution of the amount of online

consultation were significantly different not only in different areas, but also in different trimesters. The more severe the epidemic was and the more advanced the pregnancy was, the higher the percentage of second category (changed their schedules of ANC and/or delivery as well as method of delivery) was. During the COVID-19 outbreak, emergency traffic bans limited accessibility of some medical resource for pregnant women, and fear of viral transmission also prevented pregnant women from seeking routine ANC, especially in severe epidemic areas. All of these phenomena can explain the cause of the highest concern of second category in the areas with severe epidemic. Unlike the first and the second trimester, the need for more frequent ANC in the third trimester is already a huge challenge for pregnant women.^[18] In our hospitals, there were 16,120 outpatient visits in Obstetrics Clinic of the First Affiliated Hospital of Chongqing Medical University in last February, compared with 6,859 in February 2020. Furthermore, this difference was more dramatic in Maternal and Child Health Hospital of Hubei Province, because more than 21,000 outpatient visits were reduced in February 2020, compared with that of last February (27254 visits VS 5410 visits). The sharp decline of outpatient visits further reflected that pregnant women postponed or canceled scheduled ANC visits on their own. This phenomenon raised our concerns over a series of potential irreversible obstetric adverse events.

Significance of ANC.

In order to detect maternal complications, reduce adverse pregnancy events and promote doctor-patient communication, 8 “contacts” is recommended between a pregnant woman and a healthcare provider according to WHO.^[19, 20] Referring to the ANC guideline developed by America, Britain, Canada, and WHO, based on Chinese condition, *Guideline of Preconception and Prenatal Care (2018)* which was released by Chinese Medical Association, Chapter of Perinatal Medicine (the corresponding author, Professor Qi, is included) recommends 7–11 “contacts”. If there are high risk factors, the frequency should be increased appropriately. This guideline is widely applied by almost all domestic ANC institutions in China. Benefiting from the widespread application of the ANC guideline, birth defects and cesarean section rates have been reduced, and many other adverse pregnancy outcomes have been avoided in China.^[21–27] Nevertheless, during the COVID-19 outbreak, the routine ANC for pregnant women who are considered to be susceptible are extremely challenged.^[28, 29] In the past month, we noticed that some highly recommend antenatal check-ups had been canceled or postponed beyond its opportune gestational age by many pregnant women. The phenomenon might related to the delayed detection of fetal malformation and a significant increasing incidence of diabetes, macrosomia and obesity due to lack of nutritional interventions or routine physical activities. What’s more, some pregnant women wanted to be hospitalized earlier to wait for the onset of labour or to have a cesarean in advance driven by an idea that as time went on, the chance of infection would increase. On the other hand, some pregnant women with indications of hospitalization blindly refused to be hospitalized for fear of infection with COVID-19. To prevent irreversible obstetric adverse events, some highly recommended antenatal check-ups must be conducted on time, and when it comes to conduct ultrasound examination for confirming intrauterine pregnancy and Nuchal Translucency (NT) measurement, screening for foetal aneuploidy, oral glucose tolerance test (OGTT), etc., pregnant women have to visit hospital in person. And prompt hospitalization were highly

recommended in the following circumstances, approaching terminal gestational age, pregnancy with severe maternal medical condition, with signs of labor, etc..

A novel mode of ANC plan with full application of e-health.

In our survey, most of the participants were the first time to experience e-health. What's more, 91.95% pregnant women reported that they preferred e-health rather than a visit to hospital during the COVID-19 outbreak in the severe epidemic areas. The majority of pregnant women were completely or comparatively satisfied with e-health, and most of online obstetric consultations were completely or mostly solved. Except the second category, most pregnant women are more likely to consult about the first and third category, which probably due to the familiarity of e-health among the public. This result was consistent with the report of China Internet network information center (CNNIC) in June 2019.^[13] Actually, the "e" in e-health not only stands for "electronic", but also means telemedicine, telecare, clinical information systems, and other non-clinical systems used for education, public health, medical management and so on.^[30] E-health has made some achievements in the management of chronic diseases such as diabetes and hypertension disorders.^[31, 32] The application of e-health in obstetrics is mainly reflected in the abortion of unplanned pregnancy in the first trimester.^[33] The popularity of wearable devices promotes quantitative health management.^[34] Nevertheless, "e-health" cannot save everything. Some highly recommended antenatal check-ups and timely hospitalization are still necessary. Our domestic clinical ANC guideline is divided into health education and guidance, routine health care and auxiliary examination.^[18] According to the investigation of online obstetric consultation during the COVID-19 outbreak, we recommend to combine e-health with the ANC guideline in the following three aspects: (1) management of mental health, routine health education and care, authoritative prevention education on PHEs; (2) auxiliary procedures done through e-health for necessary check-ups recommended in hospital by obstetricians, such as making appointments, consulting examination reports etc.; (3) interventions of some maternal medical conditions performed through e-health, including gestational diabetes mellitus, hypertension disorders, etc., which had been fully applied in non-pregnant people.^[31] We hold that the full application of e-health and prenatal care is highly recommended to be included in the contingency ANC plan during PHEs, which will be beneficial for pregnant women and mitigate the risk of adverse pregnancy outcomes.

Conclusions

Our study revealed that online obstetric consultation is highly accepted and satisfied by the pregnant women during the COVID-19 outbreak in China. This investigation also indicated that e-health has played an important role in ANC during PHE. This novel model of ANC plan can make notable contributions not only in China, but also in other emerging epidemic centers worldwide and in future PHEs.

Abbreviations

Coronavirus Disease 2019

COVID-19;
Antenatal care
ANC;
“YunYiTong WeChat terminal service”
YYT;
Public Health Emergency of International Concern
PHEIC;
severe acute respiratory syndrome coronavirus 2
SARS-CoV-2;
World Health Organization
WHO;
China Internet network information center
CNNIC.

Declarations

Ethics approval and consent to participate

The cross-sectional study was approved by the ethics committee of the First Affiliated Hospital of Chongqing Medical University (20200501).

Consent for publication

We followed guidelines ensuring the study was voluntary and confidential, and an electronic informed consent was obtained before the questionnaire.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

HBQ, XL and MMC contributed to the protocol design. MMC and XYL collected and analyzed data. MMC drafted the manuscript, JZ, GQS, YG, YS, and PB contributed to the interpretation of results. JZ and YXZ

proofread and commented on the manuscript. HBQ and XL revised the final version and are guarantors of this manuscript. All authors made substantial contributions to the paper and read and approved the final manuscript.

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Tables

Table 1: Reasons for online consultation by areas with different severity of the epidemic.

Classification of online medical care consultation	The severity of the epidemic situation in different areas			Total	c^2	P-value
	Mild (n=448)	Moderate (n=1332)	Severe (n=819)			
Routine antenatal check-up	184(41.07)	561(42.12)	263(32.11)	1008(38.78)	86.216	0.000**
Obstetric care-seeking behaviour	91(20.31)	229(17.19)	266(32.48)	586(22.55)		
Abnormal symptoms	110(24.55)	292(21.92)	143(17.46)	545(20.97)		
Maternal comorbidity and pregnancy complications	46(10.27)	158(11.86)	80(9.77)	284(10.93)		
Other needs for e-health	17(3.79)	92(6.91)	67(8.18)	176(6.77)		

Note: Data are n (%); Chi-squared test was used for the analysis; * p<0.05 ** p<0.01.

Table 2: Reasons for online consultation by trimesters of pregnancy.

Classification of online medical care consultation	Trimesters of pregnancy			Total	c^2	P-value
	First trimester (n=417)	Second trimester (n=1054)	Third trimester (n=1128)			
Routine antenatal check-up	239(57.31)	419(39.75)	350(31.03)	1008(38.78)	151.335	0.000**
Obstetric care-seeking behaviour	45(10.79)	257(24.38)	284(25.18)	586(22.55)		
Abnormal symptoms	74(17.75)	211(20.02)	260(23.05)	545(20.97)		
Maternal comorbidity and pregnancy complications	28(6.71)	75(7.12)	181(16.05)	284(10.93)		
Other needs for e-health	31(7.43)	92(8.73)	53(4.70)	176(6.77)		

Note: Data are n (%); Chi-squared test was used for the analysis. * p<0.05 ** p<0.01.

Table 3: Reasons for online consultation by the trimesters of gestation and the severity of the epidemic.

Classification of online medical care consultation	The severity of the epidemic situation in different areas			Total	χ^2	P-value
	Mild (n=448)	Moderate (n=1332)	Severe (n=819)			
First trimester				417 (16.04)	33.422	0.000**
Routine antenatal check-up	36(58.06)	125(69.06)	78(44.83)	239(57.31)		
Obstetric care-seeking behaviour	8(12.90)	11(6.08)	26(14.94)	45(10.79)		
Abnormal symptoms	16(25.81)	25(13.81)	33(18.97)	74(17.75)		
Maternal comorbidity and pregnancy complications	2(3.23)	8(4.42)	18(10.34)	28(6.71)		
Other needs for e-health	0(0.00)	12(6.63)	19(10.92)	31(7.43)		
Second trimester				1054 (40.55)	48.869	0.000**
Routine antenatal check-up	86(45.99)	231(41.85)	102(32.38)	419(39.75)		
Obstetric care-seeking behaviour	44(23.53)	98(17.75)	115(36.51)	257(24.38)		
Abnormal symptoms	34(18.18)	133(24.09)	44(13.97)	211(20.02)		
Maternal comorbidity and pregnancy complications	11(5.88)	38(6.88)	26(8.25)	75(7.12)		
Other needs for e-health	12(6.42)	52(9.42)	28(8.89)	92(8.73)		
Third trimester				1128 (43.40)	52.766	0.000**
Routine antenatal check-up	62(31.16)	205(34.22)	83(25.15)	350(31.03)		
Obstetric care-seeking behaviour	39(19.60)	120(20.03)	125(37.88)	284(25.18)		
Abnormal symptoms	60(30.15)	134(22.37)	66(20.00)	260(23.05)		
Maternal comorbidity and pregnancy complications	33(16.58)	112(18.70)	36(10.91)	181(16.05)		
Other needs for e-health	5(2.51)	28(4.67)	20(6.06)	53(4.70)		

Note: Data are n (%); Chi-squared test was used for the analysis. * p<0.05 ** p<0.01.

Table 4: Satisfaction questionnaire

	The severity of the epidemic in different areas			Total	χ^2	P-value
	Mild	Moderate	Severe			
First time using e-health	164	644	149	/	20.178	0.000**
No	27(16.46)	168(26.09)	16(10.74)	211(22.05)		
Yes	137(83.54)	476(73.91)	133(89.26)	746(77.95)		
The degree of trouble shooting	164	644	149	/	23.274	0.001**
Completely solved	124 (75.61)	521(80.90)	98(65.77)	743(77.64)		
Largely solved	34(20.73)	115(17.86)	42(28.19)	191(19.96)		
Barely solved	4(2.44)	6(0.93)	6(4.03)	16(1.67)		
Not solved at all	2(1.22)	2(0.31)	3(2.01)	7(0.73)		
The degree of satisfaction with e-health	164	644	149	/	22.015	0.005**
Completely satisfaction	109(66.46)	438(68.01)	82(55.03)	629(65.73)		
Mostly satisfied satisfaction	43(26.22)	175(27.17)	49(32.89)	267(27.90)		
neutral attitude	11(6.71)	25(3.88)	14(9.40)	50(5.22)		
Mostly satisfied dissatisfaction	1(0.61)	0(0.00)	2(1.34)	3(0.31)		
Completely dissatisfaction	0(0.00)	6(0.93)	2(1.34)	8(0.84)		
Choice (during the COVID-19)	164	644	149	/	1.147	0.563
E-health	145(88.41)	576(89.44)	137(91.95)	858(89.66)		
Outpatient	19 (11.59)	68(10.56)	12(8.05)	99(10.34)		
Choice (after the COVID-19)	164	644	149	/	11.145	0.004**
E-health	85(51.83)	244(37.89)	66(44.30)	395(41.27)		
Outpatient	79(48.17)	400(62.11)	83(55.70)	562(58.73)		
Convenience of the e-health^M	395	1613	351	/	6.821	0.556
Time -saving	124(75.61)	535(83.07)	106(71.14)	765(79.94)		
Risk-reduction [@]	127(77.44)	534(82.92)	128(85.91)	789(82.45)		
Cost- saving	71(43.29)	268(41.61)	55(36.91)	394(41.17)		
Feeling more relax	64(39.02)	258(40.06)	59(39.60)	381(39.81)		
Others	9(5.49)	18(2.80)	3(2.01)	30(3.13)		
Needs for e-health^M	285	1087	248	/	14.474	0.070
Online video	67(23.51)	198(18.22)	50(20.16)	315(32.92)		
Physician's replay within a defined time	52(18.25)	173(15.92)	45(18.15)	270(28.21)		
Automatic referral to appropriate obstetricians	83(29.12)	370(34.04)	96(38.71)	549(57.37)		
Management of maternal medical condition	79(27.72)	318(29.25)	53(21.37)	450(47.02)		
Others [#]	4(1.40)	28(2.58)	4(1.61)	36(3.76)		

Note: Data are n (%); Chi-squared test was used for the analysis;

* p<0.05 ** p<0.01.

M:multiple choice allowed

Risk-reduction[@]: risk-reduction of being infected with COVID-19 by avoiding extra exposure.

Others[#]: remote fetal heart monitoring, electronic prescription, or online pharmacies.

Figures

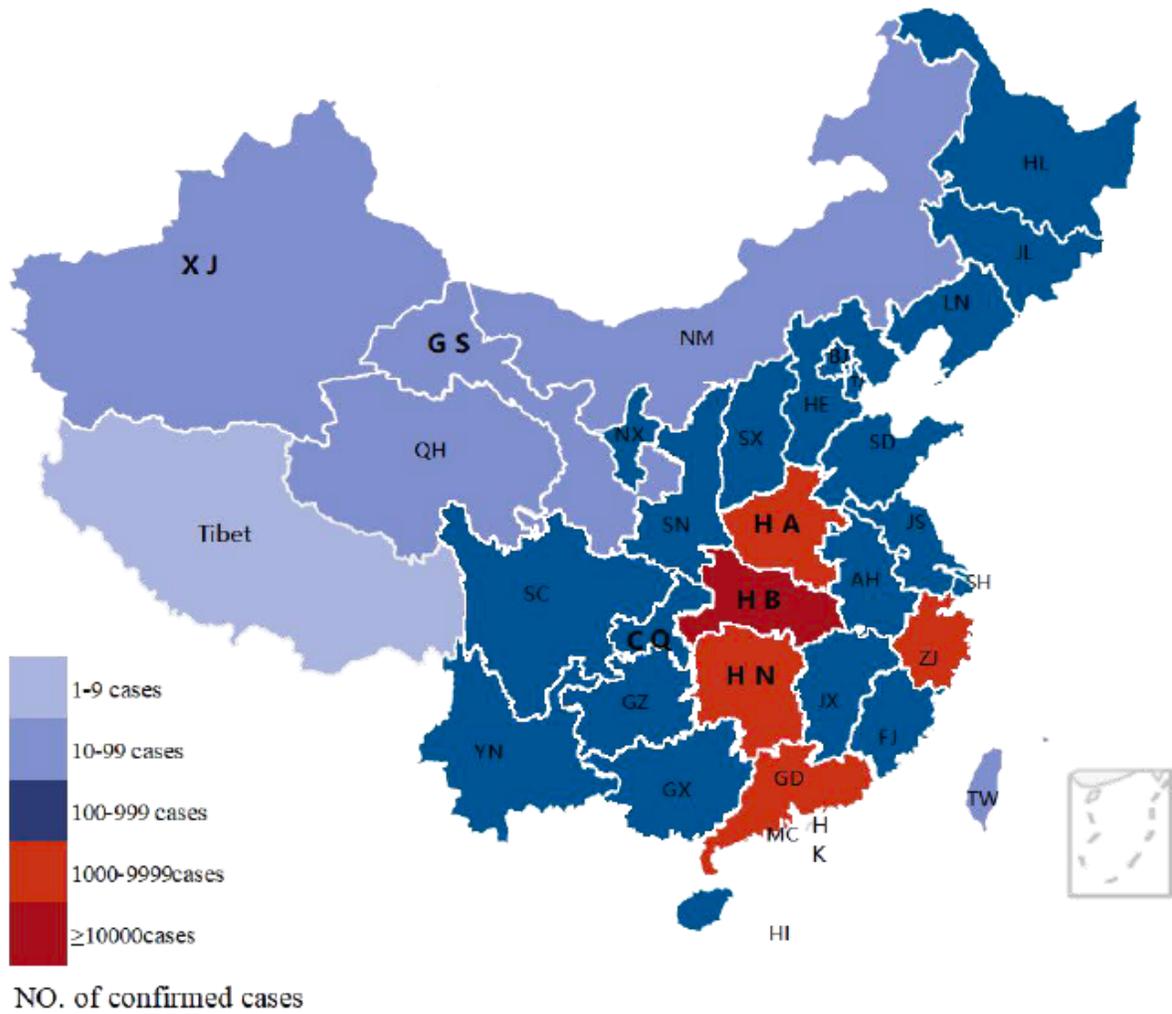


Figure 1

The map of confirmed cases of COVID-19 in China on February 23. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

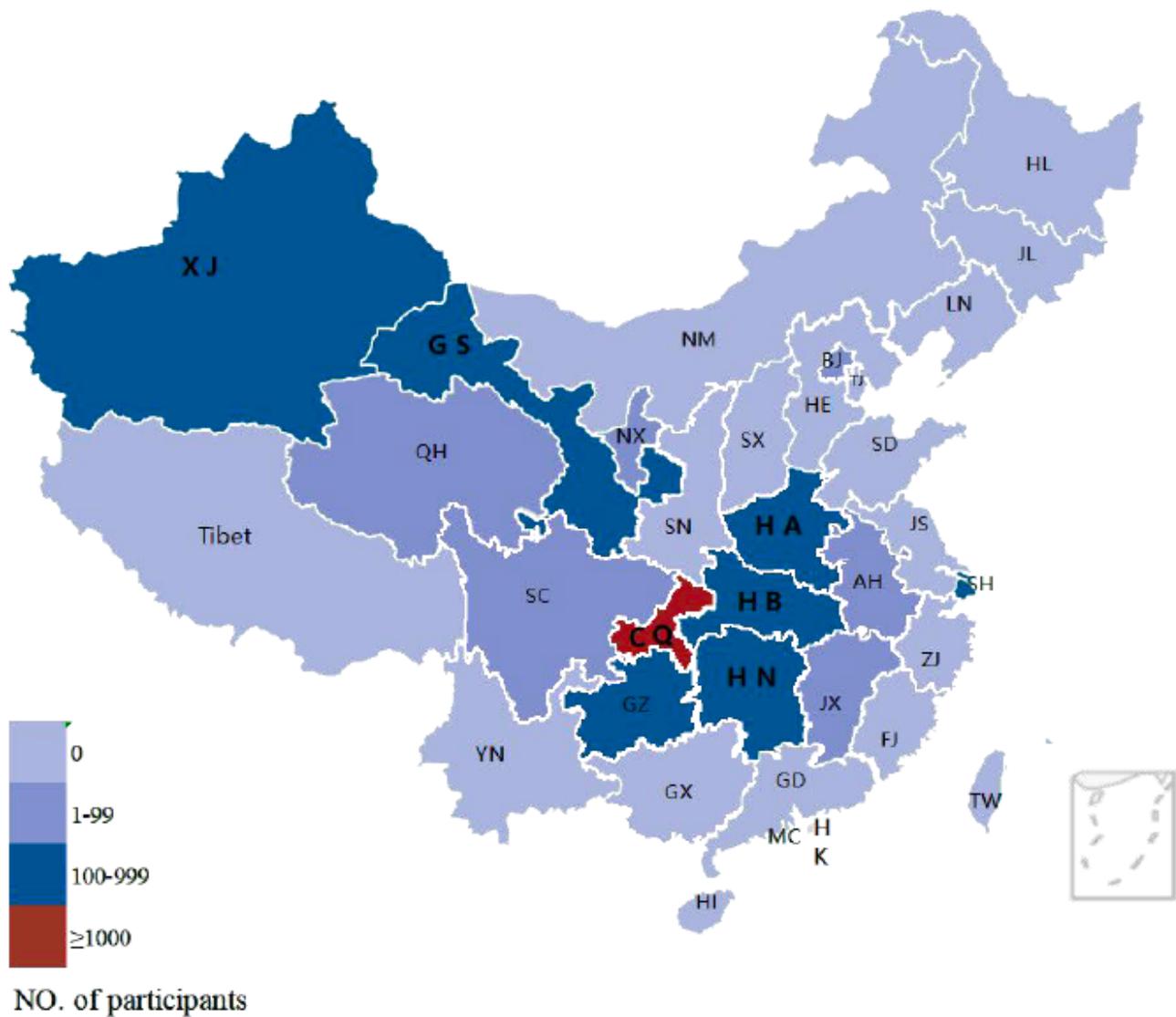
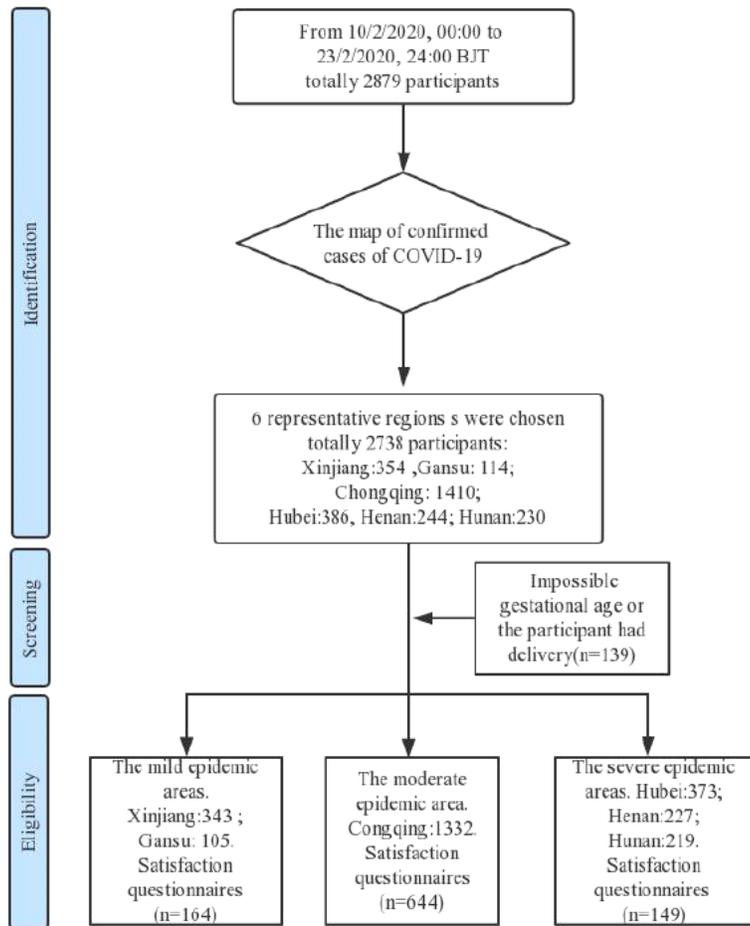


Figure 2

The map of participants' number in our study. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.



Percentage of participants in different areas

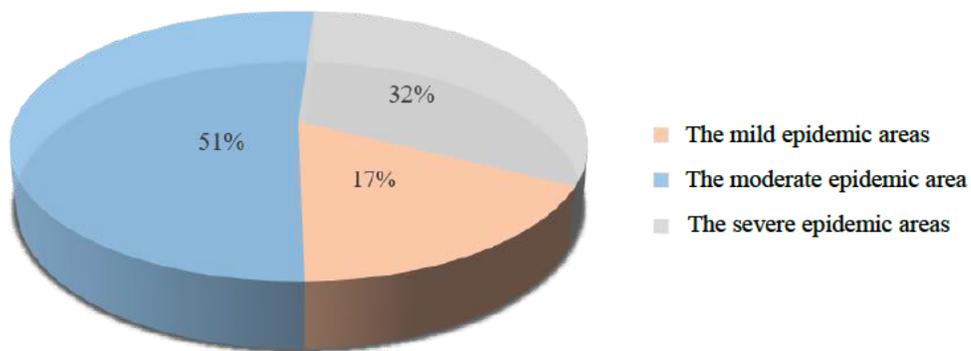


Figure 3

Process of classification and exclusion.

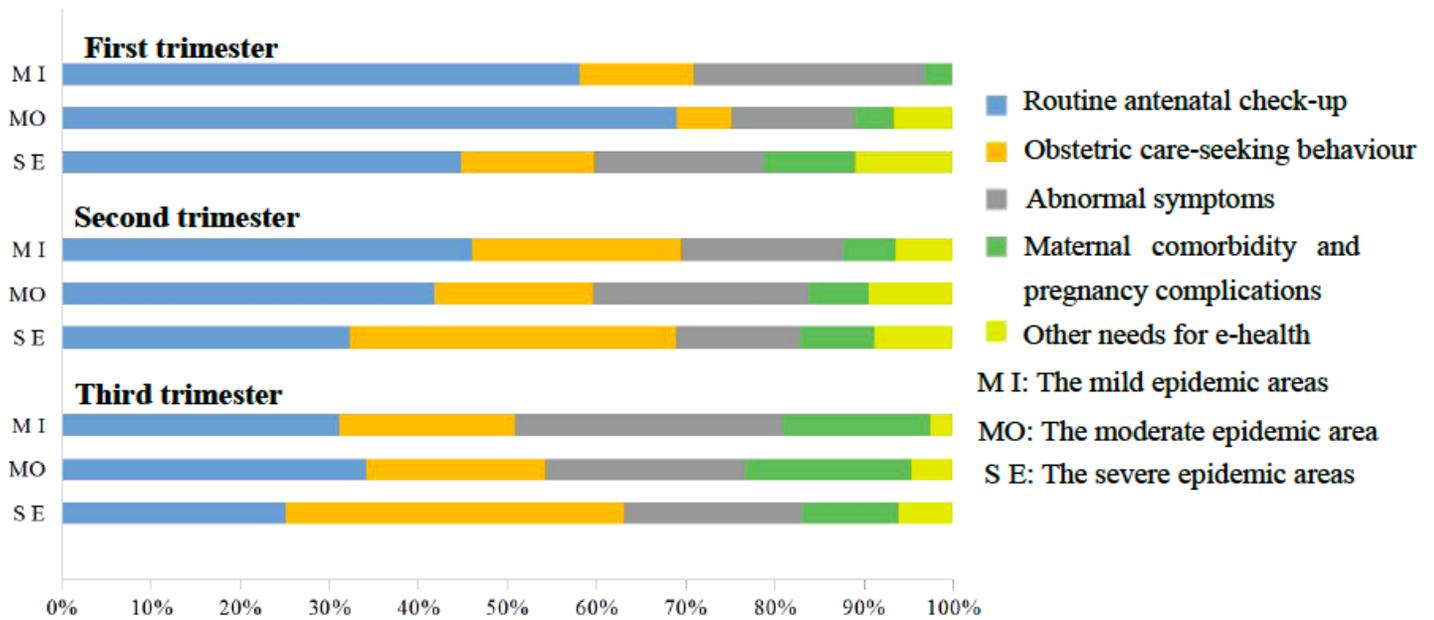


Figure 4

The proportion of the 5 categories by trimesters in each area

Supplementary Files

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- [Appendix1.pdf](#)