Needs Assessment Survey for a Food Safety Education through We-Media: A Cross-Sectional Survey among Junior Students of an Education and a Medical University in Chongqing, China

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Summary Many studies on food safety cognition and practice intervention among university students exist, but only few conduct needs assessment surveys. In recent years, We-media has been applied in the field of health education and promotion, but its application in food safety intervention is limited at home and abroad. This study aimed to explore the current situation of We-media use and assess the needs for food safety information through We-media among junior students of an education and a medical university. A cross-sectional survey was conducted among junior students of an education and a medical university in Chongqing, China in 2016. A total of 1,250 education students and 1,434 medical students participated in the questionnaire survey. Findings revealed that 71.4% and 64.8% of the education and medical students were willing to accept food safety educational information by We-media, respectively. In addition, 47.6% and 48.8% of the education and medical students were willing to accept food safety information through WeChat official accounts, respectively. Among the education students, 83.8%, 63.9%, 59.6%, and 13.0% wanted to acquire food safety knowledge by picture, text, video, and voice, respectively. Of the medical students, 84.7%, 67.7%, 62.3%, and 11.9% wanted to acquire food safety knowledge by picture, text, video, and voice, respectively. Gender, school category, and whether food safety information is given attention were the influencing factors of participants’ willingness to accept such information through We-media (p<0.05). This study indicated that We-media could be an appropriate intervention approach for the junior students of an education and a medical university to accept food safety intervention. WeChat was also revealed as the best platform. Pictures, text messages, and videos were observed the most popular means for students to acquire food safety knowledge.

Key Words We-media, food safety, intervention, need, university student

Food safety is a major global public health issue and is particularly important in heavily populated countries, such as China (1). Most foodborne disease outbreaks occur at home, restaurants, or social functions (2). Food handlers and consumers have high food safety risks, especially the university students. Previous studies have shown that university students’ food safety knowledge is insufficient, and incorrect food safety practices still exist (3–6). Such incorrect food practices are considered barriers because students move away from their parental homes and no special food safety course is available for them (3, 7). University students may have bad eating habits that put themselves at high risk by consuming unsafe foods or not following accepted food safety practices (4, 5). Eating out and ordering meals online have been popular among university students in recent years (8, 9), which has also increased their food safety risks.

Conducting food safety intervention among university students is necessary because they are vulnerable to food safety risks, but only few universities offer food safety courses (10). In this study, junior students of an education and a medical university were selected be-
cause food safety knowledge and practices are important for these groups. These students are expected to play an important role in health education and promotion after their graduation (11, 12). Most education and medical students become teachers and doctors, thus their food safety awareness and health literacy can affect their students, patients, and even the whole society.

We-media has become increasingly popular in recent years (13). It is a media carrier that enables people to share their own dynamics in real time and is characterized by high autonomy, wide audience, strong interaction, and low cost (14). We-media also exhibits a unique attraction and gathers a large number of users, just as the amount of reading shown rapid growth in the most representative social networking software in China called WeChat (the Chinese version is Weixin) (15). According to the 43rd China Statistical Report on Internet Development in 2019, the number of netizens reached 829 million, of which 817 million were mobile netizens. 26.8% were 20–29 years old, 25.4% were students, and the usage rates of WeChat Friendship Circle, QQ Space, and Weibo (commonly used We-medias in China) were 83.4%, 58.8%, and 42.3%, respectively (16).

We-media has been used in the field of health education and promotion. One study applied Facebook, which belongs to We-media, to an intervention addressing food safety knowledge, attitudes, and practices (17). Another research showed that over 90% of undergraduate medical students use Facebook, and more than 90% of them use social media, which is similar to We-media, for academic purposes and learning (18). An implementation case study demonstrated that the recruitment of college students with type 1 diabetes into a longitudinal intervention trial via social media is feasible, efficient, and acceptable (19). However, only few intervention studies through We-media have conducted needs assessment surveys.

Conducting needs assessment survey for food safety intervention through We-media among university students is necessary because understanding subjective needs helps improve the pertinence and effectiveness of any intervention. Therefore, this study aimed to explore the current situation of We-media use and the needs for food safety information through We-media among junior students of an education and a medical university.

**MATERIALS AND METHODS**

**Study design and participants.** A cross-sectional study was conducted among 2,684 junior students of an education and a medical university in Chongqing, China in 2016. According to the literature (20), 63.26% of the public were willing to obtain health information through WeChat. We set \( p = 0.6326 \) \((q = 1 - p = 1 - 0.6326 = 0.3674)\), margin of error \( d = 0.1 \), \( p = 0.1^*0.6326 = 0.06326 \), \( Z_a = 1.96 \). The sample size is \( N = Z_a^2*\frac{p*q}{d^2} = 1.96^2*0.6326*0.3674/0.06326^2 = 223 \) (21). This research used a three-stage stratified cluster sampling method to recruit participants. First, one education university and one medical university were chosen in Chongqing University Town. Second, two departments were selected in each designated university. Last, all junior students (freshmen and sophomores) were selected in each designated department. The questionnaire took approximately 15 min to complete.

**Instrument.** The questionnaire was self-designed on the basis of previous studies (17, 21–24) and the characteristics of university students in Chongqing, China. The questionnaire consisted of four sections. (1) Informed consent. (2) Demographic section to collect information about gender, age, ethnicity, grade, school category, hukou (25), monthly living expenses, and father and mother’s education. (3) Current situation of We-media use, which included items “use We-media more than once last week” (yes/no), “use We-media more than 1 h last week” (yes/no), cumulative daily use of We-media, main time of using We-media, the most frequently used We-media, and whether food safety knowledge is given attention by We-media in the previous month. (4) Needs assessment for food safety knowledge through We-media among junior students of an education and a medical university, which included “Do you want to obtain food safety knowledge by We-media?” “What kind of We-media do you want to use to obtain food safety knowledge?” “What form of food safety knowledge do you want to acquire?” “How often do you want to acquire food safety knowledge?”

**Quality assurance.** The validation of the questionnaire has been performed by a pilot study and repeated discussions with nutrition and food safety experts, medical informatics experts and statistics and epidemiology experts. The pilot study was conducted among 25 junior medical students. And descriptive statistical analysis was performed to find certain unreasonable items. The questionnaire was further revised after the pilot study and discussion with experts. All the investigators have rich investigative experiences and have been trained uniformly. They briefly explained the study and the precautions before the participants answered the questionnaires. The data were double entered in EpiData 3.1.

**Ethics statement.** This project was reviewed and approved by the Ethical Committee of Chongqing Medical University (record number: 2015012). Each participant signed an informed consent.

**Statistical analyses.** The collected data were analyzed using Social Package for Social Scientist version 22.0. Descriptive statistics were used to characterize the survey responses. Qualitative data were summarized as frequencies and percentages. The chi-square test was employed to determine the differences among categorical variables. Ordinal logistic regression analysis was used to analyze the influencing factors of food safety intervention needs among junior students of an education and a medical university through We-media. A \( p \)-value lower than 0.05 was considered statistically significant. Table 1 shows the survey indicators.
RESULTS

Demographic characteristics of the study population

As shown in Table 2, a total of 1,250 education students and 1,434 medical students participated in the questionnaire survey. Among males, 30.6% were education students and 69.4% were medical students. Among females, 52.6% and 47.4% were education and medical students, respectively. Among freshmen, 49.0% were education students and 51.0% were medical students. Among sophomores, 44.1% and 55.9% were education and medical students, respectively. In addition, 41.0% and 59.0% of education and medical students' mothers hold a high educational level, respectively. The differences in gender, grade, and mother's educational background between education and medical students were statistically significant (p<0.05).

Usage status of We-media among education and medical students

Over the past week, 2,623 (97.7%) participants used We-media more than once; of which, 46.5% were education students and 53.5% were medical students.

Table 1. Indicators and assignment of the survey.

| Variable                                      | Variable assignment |
|-----------------------------------------------|---------------------|
| Gender                                        | Male=1, Female=2    |
| Age                                           | 16–19=1, 20–24 =2   |
| Ethnicity                                     | Han=1, Minority=2   |
| School category                               | Education=1, Medicine=2 |
| Grade                                         | Freshman=1, Sophomore=2 |
| Hukou                                         | Urban=1, Rural=2    |
| Monthly living expenses                       | ≤800 RMB=1, 801–1,200 RMB=2, >1,200 RMB=3 |
| Fathers’ education/Mothers’ education         | Low education (Primary school and below)=1, Medium education (Junior school)=2, High education (High school or above)=3 |

Table 2. Demographic characteristics of the study population (n=2,684).

|                           | Education studentsa | Medical studentsb | χ²   | p       |
|---------------------------|---------------------|-------------------|------|---------|
| Gender                    |                     |                   |      |         |
| Male                      | 226 (30.6)          | 512 (69.4)        | 104.06 | 0.000*  |
| Female                    | 1,024 (52.6)        | 922 (47.4)        | 2.29  | 0.130   |
| Age                       |                     |                   |      |         |
| 16–19                     | 910 (47.5)          | 1,006 (52.5)      | 2.29  | 0.130   |
| 20–24                     | 340 (44.3)          | 428 (55.7)        | 2.29  | 0.130   |
| Ethnicity                 |                     |                   |      |         |
| Han                       | 1,114 (47.1)        | 1,249 (52.9)      | 2.59  | 0.108   |
| Minority                  | 136 (42.4)          | 185 (57.6)        | 2.59  | 0.108   |
| Grade                     |                     |                   |      |         |
| Freshman                  | 660 (49.0)          | 687 (51.0)        | 6.39  | 0.011*  |
| Sophomore                 | 590 (44.1)          | 747 (55.9)        | 6.39  | 0.011*  |
| Hukou                     |                     |                   |      |         |
| Urban                     | 586 (45.9)          | 691 (54.1)        | 0.46  | 0.499   |
| Rural                     | 664 (47.2)          | 743 (52.8)        | 0.46  | 0.499   |
| Monthly living expenses   |                     |                   |      |         |
| ≤800 RMB                  | 220 (49.7)          | 223 (50.3)        | 2.16  | 0.339   |
| 801–1,200 RMB             | 676 (46.2)          | 786 (53.8)        | 2.16  | 0.339   |
| >1,200 RMB                | 354 (45.4)          | 425 (54.6)        | 2.16  | 0.339   |
| Fathers’ education        |                     |                   |      |         |
| Low education             | 256 (48.4)          | 273 (51.6)        | 5.07  | 0.079   |
| Medium education          | 526 (48.3)          | 563 (51.7)        | 5.07  | 0.079   |
| High education            | 468 (43.9)          | 598 (56.1)        | 5.07  | 0.079   |
| Mothers’ education        |                     |                   |      |         |
| Low education             | 432 (50.2)          | 429 (49.8)        | 15.58 | 0.000*  |
| Medium education          | 480 (48.0)          | 519 (52.0)        | 15.58 | 0.000*  |
| High education            | 338 (41.0)          | 486 (59.0)        | 15.58 | 0.000*  |

aEducation students n=1,250; bmedical students n=1,434; *p<0.05.
A total of 2,592 (96.6%) participants used We-media for more than 1 h; of which, 46.6% and 53.4% were education and medical students, respectively.

**Cumulative time for education and medical students to use We-media per day**

Table 3 shows that on working days, the percentage of education students using We-media for 1–2 h per day was the highest (32.6%). Moreover, that of medical students using We-media for 2–4 h per day was the highest (34.4%). On weekends, the percentage of education and medical students using We-media more than 4 h per day was the highest, 50.4% and 44.5%, respectively. Statistical differences were observed in the cumulative time per day use of We-media between education and medical students (*p* < 0.05).

**Main time for education and medical students to use We-media**

Table 4 displays that on working days, education and medical students mainly use We-media from 21:00 to 00:00, 69.0% and 74.7%, respectively. Significant differences were found between education and medical students at 17:00–19:00, 14:00–17:00, 21:00–00:00, and after 0:00 (*p* < 0.05).

**Most commonly used We-media of education and medical students**

Table 5 presents that on working days, the most common We-media used by education and medical students was QQ, accounting for 96.8% and 98.6%, respectively. Moreover, 73.8% and 69.2% of education and medical students selected WeChat as the most common We-media, respectively. Significant differences were found in most commonly used We-media, such as WeChat, Sina Microblog, Tencent Microblog, QQ, Blog, Renren, and Zhihu, between education and medical students (*p* < 0.05). On weekends, the most common We-media used by education and medical students was QQ, accounting for 95.8% and 97.1%, respectively. In addition, 72.8% and 69.6% of education and medical students chose WeChat as the most common We-media, respectively. Significant differences were observed in most commonly used We-media, such as Tencent Microblog, Sina Microblog, Renren, and Zhihu, between education and medical students (*p* < 0.05).

**Attention to food safety information through We-media during the past month among education and medical students**

During the past month, 1,441 participants (53.7% of all participants) paid attention to food safety information through We-media, including 48.4% and 51.6% of education and medical students, respectively.
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Table 5. Most commonly used We-media of educationa and medical studentsb (n=2,684)c.

| Working day | Education students | Medical students | p  |
|-------------|--------------------|-----------------|----|
|             | n (%)              | n (%)           |    |
| **WeChat**  | 922 (73.8)         | 993 (69.2)      | 0.010* |
| Sina Micro-blog | 620 (49.6)   | 646 (45.0)      | 0.018* |
| Tencent Micro-blog | 143 (11.4)  | 100 (7.0)       | 0.000* |
| QQ          | 1,210 (96.8)       | 1,414 (98.6)    | 0.002* |
| Blog        | 21 (1.7)           | 9 (0.6)         | 0.010* |
| Renren      | 13 (1.0)           | 3 (0.2)         | 0.005* |
| Zhihu       | 219 (17.5)         | 201 (14.0)      | 0.013* |
| Post Bar    | 173 (13.8)         | 215 (15.0)      | 0.397  |
|             | 910 (72.8)         | 998 (69.6)      | 0.068  |
| Sina Micro-blog | 633 (50.6)   | 676 (47.1)      | 0.070  |
| Tencent Micro-blog | 141 (11.3)  | 101 (7.0)       | 0.000* |
| QQ          | 1,198 (95.8)       | 1,393 (97.1)    | 0.066  |
| Blog        | 34 (2.7)           | 11 (0.8)        | 0.000* |
| Renren      | 28 (2.2)           | 7 (0.5)         | 0.000* |
| Zhihu       | 229 (18.3)         | 218 (15.2)      | 0.031* |
| Post Bar    | 203 (16.2)         | 248 (17.3)      | 0.466  |

aEducation students n=1,250; b medical students n=1,434; c Multiple choice questions; *p<0.05.

Table 6. Needs for food safety intervention through We-media among educationa and medical studentsb (n=2,684).

| Education studentsa | Medical studentsb | X² | p    |
|---------------------|-------------------|----|------|
| Would you like to acquire food safety knowledge through We-media? | | | |
| Willing             | 893 (71.4)        | 929 (64.8) | 15.96 | 0.000* |
| Neutral             | 331 (26.5)        | 481 (33.5) |        |      |
| Unwilling           | 26 (2.1)          | 24 (1.7)   |        |      |
| Which kind of We-media you want to acquire food safety knowledge from?c | | | |
| WeChat official accounts | 577 (47.6) | 671 (48.8) | 7.60 | 0.055 |
| WeChat moments       | 185 (15.3)        | 160 (11.6) |        |      |
| WeChat group         | 48 (4.0)          | 58 (4.2)   |        |      |
| Sina Micro-blog      | 402 (33.1)        | 487 (35.4) |        |      |
| What form of food safety knowledge you want to acquire through We-media?d | | | |
| Text                | 799 (63.9)        | 971 (67.7) | 4.28 | 0.039* |
| 图片                | 1,047 (83.8)      | 1,215 (84.7) | 0.47 | 0.492 |
| Video               | 745 (59.6)        | 894 (62.3) | 2.11 | 0.146 |
| Voice               | 163 (13.0)        | 171 (11.9) | 0.76 | 0.383 |
| How often do you want to acquire food safety information through We-media? | | | |
| 1 time/d            | 298 (23.8)        | 310 (21.6) | 34.54 | 0.000* |
| 1 time/2 d          | 326 (26.6)        | 273 (19.0) |        |      |
| 1 time/3 d          | 282 (22.6)        | 331 (23.2) |        |      |
| 1 time/wk           | 318 (25.4)        | 494 (34.4) |        |      |
| other               | 26 (2.1)          | 26 (1.8)   |        |      |

aEducation students n=1,250; b medical students n=1,434; c lost 96; d Multiple choice questions; *p<0.05.

Needs for food safety intervention through We-media among education and medical students

Table 6 shows that 71.4% and 64.8% of education and medical students were willing to acquire food safety knowledge through We-media, respectively. The willingness of education and medical students to obtain food safety intervention through We-media indicated significant differences (p<0.05).

Moreover, 47.6% and 48.8% of education and medical students wanted to acquire food safety knowledge from WeChat official accounts, respectively.

Of the education students, 83.8%, 63.9%, 59.6%, and 13.0% wanted to acquire food safety knowledge by picture, text, video, and voice, respectively. Among the medical students, 84.7%, 67.7%, 62.3%, and 11.9% wanted to acquire food safety knowledge by picture, text, video, and voice, respectively. Significant differences in the text form of food safety knowledge existed between education and medical students (p<0.05).

Furthermore, 26.1% and 34.4% of education and medical students wanted to acquire food safety knowledge once every two days and every week, respectively. Statistical differences were found in the frequency of food safety intervention through We-media between education and medical students (p<0.05).

Comparisons of respondents’ needs for food safety intervention

Table 7 displays that among those participants willing to access food safety interventions through We-media, 74.6% were females, 70.7% were 16–19 y old, 49.0% were education students, 51.0% were medical students, 50.3% were freshmen, 53.8% were from rural areas, 54.2% had 801–1,200 RMB monthly living expenses, and 61.4% paid attention to food safety information through We-media last month. Statistical differences were observed in the willingness of participants to obtain food safety intervention through We-media among different genders, school types, and whether attention is given to food safety information through We-media last month (p<0.05).
Table 8 shows that gender, school type, and whether attention is paid to food safety information through We-media last month were the factors influencing participants’ willingness to obtain food safety intervention through We-media ($p < 0.05$).

**DISCUSSION**

We-media has become a part of the participants’ life and could be used as a platform for food safety cognition and practice intervention. Almost all education and medical students used We-media more than once over the past week. Most participants use We-media more than 2 h per day on weekdays or weekends. They also use We-media from 21:00 to 00:00 on any day, indicating that intervention information is best released at night. The current society enters into the We-media era, and everyone can share all kinds of information by using We-media platforms (26). For example, WeChat, one of the most popular We-media platforms visited daily by university students in China (22), is considered excessively used (27). WeChat is used to communicate with friends and families, play games, watch online videos, enjoy music, and read Hotpoint news for young generations (28). WeChat has also been used to change health behaviors (29, 30).

The top three We-media platforms with the highest utilization rates (weekdays or weekends) were QQ, WeChat, and Sina Micro-blog. The results were similar to the 43rd China Statistical Report on Internet Development in 2019 (16). However, the highest proportion of food safety intervention platform was expected through WeChat official accounts, which can be freely acquired and used by institutions or individuals to disseminate information; individuals can read messages and communicate with others via these official accounts (23). The reasons may be that WeChat official accounts have gradually become an important channel for people to obtain popular science information, particularly

**Table 7. Comparison of respondents’ needs for food safety intervention among education and medical college students ($n=2,684$).**

| variables                              | Willing n (%) | Neutral n (%) | Unwilling n (%) | $\chi^2$ | $p$  |
|----------------------------------------|---------------|---------------|-----------------|----------|------|
| Gender                                 |               |               |                 |          |      |
| Male                                   | 462 (25.4)    | 259 (31.9)    | 17 (34.0)       | 13.13    | 0.001* |
| Female                                 | 1,360 (74.6)  | 553 (68.1)    | 33 (66.0)       |          |      |
| Age                                    |               |               |                 |          |      |
| 16–19                                  | 1,289 (70.7)  | 588 (72.4)    | 39 (78.0)       | 1.86     | 0.395 |
| 20–24                                  | 533 (29.3)    | 224 (27.6)    | 11 (22.0)       |          |      |
| Ethnicity                              |               |               |                 |          |      |
| Han                                    | 1,609 (88.3)  | 708 (87.2)    | 46 (92.0)       | 1.43     | 0.490 |
| Minority                               | 213 (11.7)    | 104 (12.8)    | 4 (8.0)         |          |      |
| School category                        |               |               |                 |          |      |
| Education                              | 893 (49.0)    | 331 (40.8)    | 26 (52.0)       | 15.96    | 0.000* |
| Medicine                               | 929 (51)      | 481 (59.2)    | 24 (28.0)       |          |      |
| Grade                                  |               |               |                 |          |      |
| Freshman                               | 916 (50.3)    | 408 (50.2)    | 23 (46.0)       | 0.36     | 0.836 |
| Sophomore                              | 906 (49.7)    | 404 (49.8)    | 27 (54.0)       |          |      |
| Hukou                                  |               |               |                 |          |      |
| Urban                                  | 842 (46.2)    | 408 (50.2)    | 23 (46.0)       | 4.51     | 0.105 |
| Rural                                  | 980 (53.8)    | 404 (49.8)    | 27 (54.0)       |          |      |
| Monthly living expenses                |               |               |                 |          |      |
| ≤800 RMB                               | 319 (17.5)    | 120 (14.8)    | 4 (8.0)         | 6.49     | 0.165 |
| 801–1,200 RMB                          | 988 (54.2)    | 446 (54.9)    | 28 (56.0)       |          |      |
| >1,200 RMB                             | 515 (28.3)    | 246 (30.3)    | 18 (36.0)       |          |      |
| Fathers’ education                     |               |               |                 |          |      |
| Low education                          | 372 (20.4)    | 143 (17.6)    | 14 (28.0)       | 7.05     | 0.133 |
| Medium education                       | 741 (40.7)    | 334 (41.1)    | 14 (28.0)       |          |      |
| High education                         | 709 (38.9)    | 335 (41.3)    | 22 (44.0)       |          |      |
| Mothers’ education                     |               |               |                 |          |      |
| Low education                          | 599 (32.9)    | 243 (30.2)    | 17 (34.0)       | 5.95     | 0.203 |
| Medium education                       | 690 (37.9)    | 292 (36.0)    | 17 (34.0)       |          |      |
| High education                         | 533 (29.3)    | 275 (33.9)    | 16 (32.0)       |          |      |
| Whether Paid Attention to Food Safety Information through We-media | 1,119 (61.4) | 304 (37.4)    | 18 (36.0)       | 136.29   | 0.000* |
| Yes                                    | 703 (38.6)    | 508 (62.6)    | 32 (64.0)       |          |      |

* $p < 0.05$.
health education messages (23). People accept such information because it is short, interesting, and authoritative with graphics and textual combinations.

Approximately two-thirds of the participants were willing to acquire food safety knowledge through We-media. Therefore, medical and education students had subjective needs for food safety knowledge, and We-media is an acceptable means of intervention. The participants might have realized that they lack knowledge of food safety and perform inappropriate food safety practices. Furthermore, food safety courses for most universities in China are limited, even for medical students. Therefore, obtaining food safety knowledge through We-media is convenient for them.

The proportion of medical students willing to obtain food safety information through We-media was significantly higher than that of education students. The reasons might be that food safety information is closely related to health and medical students have higher health literacy than other majors (31). Additional efforts should be made to improve the willingness of education students to obtain food safety information through We-media.

The needs for food safety information were characterized by the diversification of forms and fragmentation of time. Many participants wanted to acquire food safety knowledge by picture, text, or video, whereas few of them wanted to acquire food safety knowledge by voice. One study revealed that text, photo, voice, and video are all used in developing health education programs because these types of messages may attract users’ interest and willingness to engage (23). Other studies found that people prefer practical, interesting, and personalized content from We-media (14, 32). The language used in We-media was fragmented, and each person could release news whenever and wherever (15).

This study had certain limitations. First, the participants were junior students of an education and a medical university, who cannot be a representative sample of all university students. Second, the statements “using We-media more than once over the past week” and “using We-media more than 1 h over the past week” were not enough to truly reflect their usage rate of We-media. Further, the study was based on self-report which is amenable to dishonesty and measurement errors. Finally, the design of the study was cross-sectional which prevents making causal inferences.

CONCLUSIONS

We-media could be used as a platform for food safety cognition and practice intervention among junior students of a normal and a medical university. Most of them needed to acquire food safety knowledge through We-media. The most suitable intervention platform of We-media might be WeChat official accounts. Picture, text, and video were the most popular forms for students to acquire food safety knowledge. Furthermore, releasing intervention information after class at night was preferred.

Author contributions

In this study, Yong Zhao and Xinmiao Luo conceived, designed, and performed the experiments. Xinmiao Luo analyzed the data and wrote the paper. Li Luo, Hongyan Liu, Yangxue Xiao and Xinyang Yu collected the data and revised the manuscript. Xiaorong Hou, Fan Zhang, Yong Zhang and Huan Zeng helped revise the manuscript. Manoj Sharma contributed in data interpretation and final editing of the manuscript. All authors read and approved the final manuscript.

Disclosure of state of COI

The authors declared no conflict of interest associ-
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