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ORIGINAL ARTICLE

Factors associated with incorrect facemask use among individuals visiting high-risk locations during COVID-19 pandemic

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ABSTRACT

In December 2019, an outbreak of a novel coronavirus disease (COVID-19, previously known as 2019-nCoV) was determined to be transmitted via respiratory droplets. Thus, health agencies have recommended the use of facemasks as a protective measure. The current study investigated the prevalence and factors contributing to incorrect facemask use among individuals visiting high risk public locations. A cross-sectional observational study of facemask use among individuals visiting high risk public facilities was conducted during a local COVID-19 outbreak from end of April to middle of May 2020 in Sitiawan, Perak, Malaysia. Enrolment in the study included any individuals entering the selected study facilities via a dedicated entry point. Suitable study locations were identified as a local wet market selling freshly slaughtered animals and a district specialist hospital.Trained data collectors were stationed at the entry points to observe individuals entering the selected facilities for the type, category, and correct facemask use. Individuals were categorized into two groups, correct and incorrect facemask users, based on visual observation of facemask use. The Pearson chi-square test was used for differences in investigated variables. Both binary and multiple logistic regression models were used in this study. The study protocol was approved by the institutional review board. The main outcome measure was facemask use (either correct or incorrect).A total of 3322 individuals with a high prevalence of facemask use (98.2%) consisting of a large proportion of medical-grade face masks (75.5%) were included in this study. Male individuals, Malay ethnic people, high-risk age groups, and those wearing a medical grade facemask were more likely to present incorrect facemask use. A high prevalence of facemask use among individuals visiting public facilities was observed. However, incorrect facemask use raises the need for of targeted public health strategy to mitigate the impact of COVID-19 epidemic.

Keywords COVID-19, personal protective equipment, odds ratio, Malaysia

INTRODUCTION

In December 2019, an initial cluster of pneumonia of an unknown aetiology was reported in Wuhan, China[1]. The pathogen responsible for the outbreak was later identified as a novel beta-coronavirus, named COVID-19 (previously known as 2019-nCoV or SARS-CoV-2). By March 2020, following a 1.5% to 3.6% fatality rate as reported by the China Centres for Disease Control and Prevention[2], the World Health Organization (WHO) declared the infection a pandemic, indicating a significant public health emergency of international concern[3].

In general, establishment of the COVID-19 epidemic is believed to be sustained by human-to-human transmission mainly through respiratory droplets due to coughing and sneezing similar to other respiratory infections, including flu and rhinovirus[4]. Although the consensus of asymptomatic individuals transmitting the virus before symptom development seems to be inconclusive, risk of transmission cannot be fully excluded[5]. The epidemiological transmission of the disease suggests that a public health strategy, such as advocating use of personal protective equipment (PPE), such as a facemask and isolating and limiting accessibility to high density public locations, should be implemented to contain the spread of the epidemic[6, 7].

During the early stage of the outbreak, graphic pictures of civilian, authorities, and health care personnel wearing extensive PPE were widely covered by media highlighting the importance of hygiene barriers in preventing infection spread[8]. Once the local epidemic began, a substantial increase in the use of PPE both in community and healthcare settings were reported[9, 10]. A research group led by Feng et al. compiled the conflicting recommendation by different agencies. For example, Western countries such as the health authorities of the United States, United Kingdom, and Germany have advised against buying masks for use by healthy people, while Asian countries such as China, South Korea, and Japan have adopted a risk-based approach by distributing facemasks to the general public[11]. While there was consistency in the recommendation that symptomatic individuals and health care workers should use facemasks, discrepancies in facemask use were observed in the general population.

Factors in accepting the recommendations on facemask use have been widely discussed in relation to accessibility, utilization and blocking human-to-human transmission[11]. The researchers concluded that facemask use might reinforce people's sense of personal control and alleviate perception on self-vulnerability. However, researchers also have highlighted concerns that mask wearing could provide a false sense of security. This, in turn, could lead to neglect of other means of risk reduction such as social distancing and hand washing

Ideally, basic PPE, such as facemasks, should be available en masse, especially for vulnerable populations and people with underlying health conditions. However, in this unprecedented worldwide pandemic, the sociodemographic use of facemasks among the general population is relatively unknown[12]. Investigating the prevalence of facemask use among individuals visiting public facilities could be an indicator of social adaptability in response to local disease outbreak. The findings of this research could be used to improve strategic management both of

public health and of the COVID-19 pandemic in a community setting.

Aim of The Study

This study aimed to investigate the prevalence, types, and correctness of the facemask use by individuals visiting high risk public locations during the COVID-19 pandemic.

Ethics Approval

The ethical approval to conduct the study was obtained from the Medical Ethical Review Committee (MERC KKM. NIHSEC. P20-902[6] and MERC KKM. NIHSEC. P20-1002[6]) Ministry of Health, Malaysia.

METHODS

Study setting

This cross-sectional observational study was conducted among individuals visiting a wet market and district specialist hospital in Sitiawan, Perak, Malaysia. During the COVID-19 pandemic, both of these facilities have closed all peripheral entrances, and visitors was screened for respiratory symptoms and body temperature was measured before allowed to enter the facility via dedicated entry points. The required data were recorded based on observations by trained data collectors who were stationed at a strategic entry point. The data collection was done from March 30th to April 12th, 2020 during the facilities' normal operating hours (8 AM to 5PM for hospital and 6 AM to 12 PM for market).

Inclusion and Exclusion

Inclusion criteria for this study consisted of any individuals entering the facilities from entry points without respiratory symptoms. Exclusion criteria for this study consisted of individuals < 2 years old, facility staff, and individuals who were suspected of entering multiple times.

Data Variables

Individual data were collected by visually observing the type of the facemask and evaluating the correctness of facemask use among visitors entering the study facilities. Demographic data, such as patient's gender, age group, and ethnicity and facemask data, such as category and correctness of facemask use, were recorded. Patient ethnicity was categorised into Malay or Non-Malay to reflect population distribution. The visitor's age group was recorded as either children, adult, or elderly, which was done based on an individual's facial and physical feature[13]. The age group was further divided into low-risk (children and adult) or high-risk age (elderly) groups[14]. Facemask use was classified as either "Yes" when the any type of facemask was used or as "No" when the facemask was absent. The category of facemask choice was described as: (1) surgical facemask (2-, 3-ply, or any medical grade mask); (2) respirators (N95, FFP2/3, or the equivalent respirators); (3) cloth mask, or (4) paper mask. The facemask was further categorized as medical (surgical facemask and respirator) or non-medical grade (cloth and paper masks). The correct use of facemask was visually assessed for position of coloured side and usage in which the correct criteria was defined as the facemask with coloured side out and top of the mask tightly covering the nose while the bottom of the mask covered the mouth and chin. Incorrect practice was defined as facemask with coloured side in, exposure of nose and/or mouth, or without providing adequate fitting around the nose and mouth.

Statistical analysis

All demographic and categorical variables were presented as number (n) and percentage (%).Pearson's chi-squared test was used to determine the statistically significant differences in correct use of facemask among the demographic characteristics. A simple logistic regression was used to screen independent variables. Variables with p value < 0.25 were included in the multivariate analysis. A binary logistic regression analysis was applied to determine the contributing factors to incorrect facemask use. The Hosmer–Lemeshow test and classification table were used to evaluate goodness-of-fit of the model. The final model was presented with 95% confidence interval (CI) and its corresponding p-value. For all tests, a two-tailed p-value < 0.05 was considered as statistically significant. All statistical analyses were performed using SPSS for Windows version 22.0 (SPSS Inc., Chicago, Illinois, USA).

RESULTS

A total of 3322 individuals were included in this study. Baseline demographic and facemask use are shown in Table 1. Higher proportions of males compared to females (58.5% vs 41.2%) and of Malays compared to non-Malays (62.2% vs 37.4%) were visiting the high-risk locations. A substantially higher proportion of low-risk age group consisting of children and adults were observed compared to high-risk population of elderly individuals (80.9% versus 19.1%). Among the 71 children, 66 (93.0%) of them were visiting hospital while the remaining 5 (7.0%) children were observed in the wet market (data not shown in the table). As for facemask usage, a high prevalence of facemask usage (98.2%) was observed and consisted of a of large fraction of medical-grade face masks (75.5%).

Table 1 Demographic characteristic , facemask type and usage among individuals visiting high risk public facilities during visit local COVID 19 outbreak (n=3322)

Description	n (%)
Gender	
Male	1954 (58.8)
Female	1368 (41.2)
Ethnic	
Malay	
Malay	2080 (62.6)
Non-Malay	
Chinese	467 (14.1)
Indian	737 (22.2)
Unidentifiable	38 (1.1)
Age Group	
Low-risk Age group	
Children	71 (2.1)
Adult	2617 (78.8)
High-risk Age group	
Elderly	634 (19.1)
Facemask Use	
Yes	3261 (98.2)

Description	n (%)
No	61 (1.8)
Category of Facemask	
Did not wear face mask	61(1.8)
Medical Grade	
Surgical facemask	2444 (73.6)
Respirator	64 (1.9)
Non-Medical Grade	
Cloth mask	543 (16.3)
Paper mask	210 (6.3)

Differences in correct facemask use by demographic variables are summarized in Table 2. Among the 3261 individuals using a facemask, 3009 individuals (92.3%) presented correct facemask use while the remaining 252 individuals (7.7%) showed incorrect facemask use. Statistically significant differences in distribution between correctness of facemask use and demographic variable of gender ($p = 0.004$), ethnicity ($p = 0.006$) and age group ($p < 0.001$) were observed. Within 252 individuals with incorrect facemask use, 182 of them were wearing the wrong side out (all from the medical grade facemask group), 65 wore the mask loosely exposing either the nose, mouth, or both, four individuals wore makeshift facemasks using a bandana and handkerchief while one used an eye cover as a facemask

Table 2 Demographic characteristic between correctness of facemask use (n=3261)

Description	Correct n (%)	Incorrect n (%)	p-value (<0.05)
Gender			.004
Male	1748(91.1)	170(8.9)	
Female	1261(93.9)	82(6.1)	
Ethnic			.006
Malay	1852(91.3)	177(8.7)	
Non-Malay	1157(93.9)	75(6.1)	
Age group			<.001
Low-risk	2472(93.7)	166(6.3)	
High-Risk	537(86.2)	86(13.8)	
Category of face mask			.058
Medical Grade	2302(91.8)	206(8.2)	
Non-Medical Grade	707(93.9)	46(6.1)	

Table 3 presents the multivariate binary logistic regression model for incorrect facemask use. After adjusting for other variables, all four investigated variables had a significant relationship with incorrect facemask use. Male individuals were 1.51 times (adjusted odds ratio: AOR=1.51; 95% CI: 1.14–2.00; $p = 0.004$), those of Malay ethnicity were 1.90 times (AOR=1.90; 95% CI: 1.42–2.55; $p = 0.004$) while the high-risk age group were 1.92 times (AOR=1.92; 95% CI: 1.43–2.58; $p < 0.001$) and individuals using medical grade facemasks were 1.46 times (AOR=1.46; 95% CI: 1.04–2.05; $p = 0.027$) more likely to have incorrect facemask use.

Table 3 The adjusted factor of incorrect facemask use by Multiple logistic regression (n=3261)

Description	Adj. odds ratio (95% CI)	Wald Statistic	p-value (<0.05)
Gender			
Female	Reference		
Male	1.51 (1.14,2.00)	8.28	.004
Ethnic			
Non-Malay	Reference		
Malay	1.90 (1.42,2.55)	18.54	<.001
Age group			
Low-risk	Reference		
High-risk	1.92 (1.43,2.58)	18.55	<.001
Category of face mask			
Non-Medical Grade	Reference		
Medical Grade	1.46 (1.04,2.05)	4.86	.027

Adj. odds ratio: Adjusted odds ratio, CI: Confidence interval . Hosmer and Lemeshow goodness-of-fit test was $\chi 2(8) = 2.815$, $p = .945$ while Cox & Snell $R^2 = .031$ and Classification table (overall classification percentage 92.3%) indicating goodness of fit of the model.

DISCUSSION

The COVID-19 pandemic is an unprecedented medical event in the modern times. However, COVID-19 is not the first incidence of a zoonotic pathogenic outbreak we have experienced as there have been several other coronavirus-related outbreaks within the past two decades.

To date, most efforts have focused on clinical management, defining the spectrum of disease, and tracking morbidity and mortality of SARS-CoV-2 infection[15, 16]. As no effective treatment is available, health care authorities have had to rely on public health management to mitigate local human-to-human transmission. Generally, Asian health care authorities have recommended using facemasks and practising social distancing to reduce cross-transmission[17]. This recommendation has led to a surge in the demand for medical facemasks. Notably, China as the epicentre of the outbreak, estimated that the daily demand of facemask surged to > 50 million whereas the daily production has now dropped from 20 to 15 million [17]. This decrease in production has resulted in a shortage of medical facemasks, which appears to be a worldwide phenomenon [18].

Although Malaysia has reported a shortage of facemasks during the initial outbreak, the high prevalence of individuals (98.2%) wearing facemask with the majority of them were using medical grade facemask (75.5%) indicate accessibility of facemasks in the local community. The widespread use and availability of these facemasks could be due to a few initiatives taken by the Malaysian government, namely, importation of 10 million facemasks from China during the acute shortage phase, an increase in manufacturing and establishment of a new manufacturing facility to increase in production capacity of local manufacturer, and handing out 24.6 million facemasks to Malaysian households[19].

The significantly higher incorrect facemask use among high-risk age group (OR=1.92; 95% CI: 1.43–2.58; p < 0.001) and among those wearing medical grade facemasks (OR=1.46; 95% CI: 1.04–2.05; p = 0.027) is worrying as incorrect facemask use may not form a tight seal against the face skin which is required to provide effective prevention. Current evidence suggest COVID-19 infection could happen through the mucous membranes of the eyes[20] raises the question of the necessity of medical grade facemask use in the community setting [21, 22]. Nonetheless, two community-based retrospective case-control studies in Hong Kong and China during the previous 2003 SARS-CoV-1 outbreak reported that use of medical grade facemasks (surgical masks in both studies) was associated with at least 60% lower odds of contracting SARS[23, 24]. While waiting for effective antiviral treatment against COVID-19, increasing evidence supports the use of facemask as a low-cost addition combined with social distancing and hand hygiene during the COVID-19 pandemic[25].

The high saturation of facemask usage should be welcomed as the rationale behind wearing facemasks has been widely discussed in relation to preventing human-to-human transmission[26]. Although the consensus that asymptomatic individuals transmit the virus before symptoms develop seems to be inconclusive, a risk of transmission cannot be fully excluded favouring the use of facemask as safety precaution[27]. While there is consistency in the recommendation that symptomatic individuals and healthcare workers should use facemasks, discrepancies in recommendations for facemask use by the general population use varies greatly between countries. Feng et al. and colleagues compiled contradictory views by difference agencies; generally, the western countries, such as the United States, United Kingdom and Germany have advised against the use of facemasks by the healthy general population, while Asian countries such as China, South Korea, and Japan have adopted a risk-based approach by distributing facemasks to the general public[11]. South Korea was one of the hardest-hit countries during the initial outbreak but has managed to successfully contain their COVID-19 outbreaks without lockdown via the use of extensive testing, rigorous contact tracing, and strict isolation in addition to the requirement for universal use of facemasks in public locations [28]. Similarly, Hong Kong with the world's highest prevalence of public facemasks reported a shorter influenza season (5 versus 12–18 weeks) during the first wave of the COVID-19 epidemic[17]. The different approaches to facemask use by Asian countries could be the result of adaptive response after the experience with previous exposure to regional SARS epidemic where facemask use has been the public norm even after the epidemic subsided[29].

Despite the high prevalence of facemask use among this study population, significantly high number of males, those of Malay ethnicity, and high-risk age groups had incorrect facemask placement. Incorrect facemask use among this group raises concerns as males were shown to be 1.51 times more likely to die from COVID-19[30]. Although the current rate of mortality due to COVID-19 among Malay ethnicity is unknown, comorbidity among Malay ethnicity predisposed them to increased hazards of death; thus, mortality risks for both of these groups have been well established[31-33].

Evidence that facemasks can protect against infections in the general population has been widely debated[21, 22, 25]. From a result of three randomised clinical trials meta-analysis, wearing facemasks has reduced the odds of developing respiratory symptoms by around 0,6% (OR 0.94, 95% CI 0.75-1.19)[34]. Two community-based retrospective case-control studies in Hong

Kong and China during the previous 2003 SARS-CoV-1 outbreak reported that use of medical grade facemasks (surgical masks in both studies) was associated with at least 60% lower odds of contracting SARS[23, 24]. The contradicting views of facemask usage are due to the lack of conclusive research findings, which need to be established during a pandemic when facemask compliance is high enough for its effectiveness to be assured. However, a mathematical simulation model by Eikenberry et al. suggests the use of facemasks by the general public could potentially restrain community transmission and reduce mortality rate due to Covid-19 pandemic by 24% to 65%[35]. Using hindsight, the effectiveness of facemask usage in preventing human-to-human transmission could have been evaluated using a longitudinal study during this pandemic session.

Although the high saturation of face mask usage is welcomed, the mental wellbeing contributing to such high saturation of usage should not be neglected. A report by Lin et al. correlated an all-time extensive search for "face mask" in Google as a sign of anxiety appearing in the society[36] while on the other hand, a study by Szczesniak et al. and colleagues imply the use of facemask could increase the level of perceived self-protection and of social solidarity which, thereby improve mental health wellbeing[37]. However, non-compliance with facemask use, such as loosely fitted facemasks and exposing mouth and nose exposure as observed by us have also been reported as a main concern in previous studies by other researchers[37, 38].

This study is the first in Malaysia to report facemask usage among the general population; however, our findings are not generalizable as our population consisted of individuals visiting a hospital and wet market, which are generally considered as high risk areas for cross-infection, and visitors could have taken extra precautions which otherwise would not be used. Use of these setting could have skewed our observations. In addition, the prevalence of facemask use could be influenced by demographic variables, such as education levels, socioeconomics, health status, occupation, and availability of the commercial product on market, all of which were not investigated in this study. Besides that, we only observed general facemask usage and were unable to assess the quality of the fitting adequacy of the facemask.

CONCLUSION

The ongoing COVID-19 pandemic is an unprecedented medical event, and no single strategy has been proven to successfully contain the outbreak. Facing a worldwide health emergency with limited effective clinical treatment, public health management is of paramount important for mitigating the stress on the healthcare system. In spite of contradicting opinions on the potential value of facemasks for general population use, the widespread availability and lack of obvious harm, the use of a facemask together with other environmental hygiene measures is a vital epidemiological strategy that may help to alleviate the COVID-19 epidemic impact.

CONFLICTS OF INTEREST

The authors declared that they have no conflict of interest

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REFERENCES

1. Lai C-C, Shih T-P, Ko W-C, Tang H-J, Hsueh P-R. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and corona virus disease-2019 (COVID-19): the epidemic and the challenges. International journal of antimicrobial agents 2020;105924.
2. Baud D, Qi X, Nielsen-Saines K, Musso D, Pomar L, Favre G. Real estimates of mortality following COVID-19 infection. The Lancet infectious diseases; 2020.
3. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). International Journal of Surgery 2020.
4. Guo Y-R, Cao Q-D, Hong Z-S, Tan Y-Y, Chen S-D, Jin H-J, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak–an update on the status. Military Medical Research 2020;7(1):1-10.
5. Hu Z, Song C, Xu C, Jin G, Chen Y, Xu X, et al. Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. Science China Life Sciences 2020;1-6.
6. Yuan J, Lau EH, Li K, Leung YC, Yang Z, Xie C, et al. Effect of live poultry market closure on avian influenza A (H7N9) virus activity in Guangzhou, China, 2014. Emerging infectious diseases 2015;21(10):1784.
7. Yuan J, Tang X, Yang Z, Wang M, Zheng B. Enhanced disinfection and regular closure of wet markets reduced the risk of avian influenza A virus transmission. Clinical infectious diseases 2014;58(7):1037-8.
8. Holland M, Zaloga DJ, Friderici CS. COVID-19 Personal Protective Equipment (PPE) for the emergency physician. Visual Journal of Emergency Medicine 2020;19:100740.
9. Rowan NJ, Laffey JG. Challenges and solutions for addressing critical shortage of supply chain for personal and protective equipment (PPE) arising from Coronavirus disease (COVID19) pandemic–case study from the Republic of Ireland. Science of the Total Environment 2020;138532.
10. Gunasekaran GH, Gunasekaran SSS, Gunasekaran SS, Halim FHA, Zaimi NSI. Prevalence and acceptance of glove wearing practice among general population when visiting high risk are during local COVID-19 outbreak. medRxiv 2020.
11. Feng S, Shen C, Xia N, Song W, Fan M, Cowling BJ. Rational use of face masks in the COVID-19 pandemic. The Lancet Respiratory Medicine 2020.
12. Brienen NC, Timen A, Wallinga J, Van Steenbergen JE, Teunis PF. The effect of mask use on the spread of influenza during a pandemic. Risk Analysis: An International Journal 2010;30(8):1210-8.
13. Horng W-B, Lee C-P, Chen C-W. Classification of age groups based on facial features 2001;4(3):183-92.
14. Organization WH. Population-based age-stratified seroepidemiological investigation protocol for coronavirus 2019 (COVID-19) infection, 26 May 2020: World Health Organization 2020.
15. Chen L, Xiong J, Bao L, Shi Y. Convalescent plasma as a potential therapy for COVID-19. The Lancet Infectious Diseases 2020:20(4):398-400.
16. Cortegiani A, Ingoglia G, Ippolito M, Giarratano A, Einav S. A systematic review on the efficacy and safety of chloroquine for the treatment of COVID-19. Journal of critical care 2020.
17. Chan KH, Yuen K-Y. COVID-19 epidemic: disentangling the re-emerging controversy about medical facemasks from an epidemiological perspective. International Journal of Epidemiology 2020.

18. Mahase E. Novel coronavirus: Australian GPs raise concerns about shortage of face masks. BMJ 2020;368:m477.
19. Gunasekaran GH, Gunasekaran SSS, Gunasekaran SS, Zaimi NSI, Halim NAA. Prevalence of facemask use among general public when visiting wet market during Covid-19 pandemic: An observational study. medRxiv. 2020.
20. Lee S-A, Hwang D-C, Li H-Y, Tsai C-F, Chen C-W, Chen J-K. Particle size-selective assessment of protection of European standard FFP respirators and surgical masks against particles-tested with human subjects. Journal of healthcare engineering 2016.
21. Jefferson T, Del Mar C, Dooley L, Ferroni E, Al-Ansary LA, Bawazeer GA, et al. Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review. Bmj 2009;339:b3675.
22. MacIntyre CR, Cauchemez S, Dwyer DE, Seale H, Cheung P, Browne G, et al. Face mask use and control of respiratory virus transmission in households. Emerging infectious diseases 2009;15(2):233.
23. Wu J, Xu F, Zhou W, Feikin DR, Lin C-Y, He X, et al. Risk factors for SARS among persons without known contact with SARS patients, Beijing, China. Emerging infectious diseases 2004;10(2):210.
24. Lau JT, Tsui H, Lau M, Yang X. SARS transmission, risk factors, and prevention in Hong Kong. Emerging infectious diseases 2004;10(4):587.
25. MacIntyre CR, Chughtai AA. Facemasks for the prevention of infection in healthcare and community settings. Bmj 2015;350:h694.
26. Kucharski AJ, Russell TW, Diamond C, Liu Y, Edmunds J, Funk S, et al. Early dynamics of transmission and control of COVID-19: a mathematical modelling study. The lancet infectious diseases 2020.
27. Bai Y, Yao L, Wei T, Tian F, Jin D-Y, Chen L, et al. Presumed asymptomatic carrier transmission of COVID-19. Jama 2020.
28. Cheng KK, Lam TH, Leung CC. Wearing face masks in the community during the COVID-19 pandemic: altruism and solidarity. The Lancet 2020.
29. Lau JT, Yang X, Tsui H, Kim JH. Impacts of SARS on health-seeking behaviors in general population in Hong Kong. Preventive medicine 2005;41(2):454-62.
30. Caramelo F, Ferreira N, Oliveiros B. Estimation of risk factors for COVID-19 mortality-preliminary results. medRxiv 2020
31. Alderman AK, Collins ED, Schott A, Hughes ME, Ottesen RA, Theriault RL, et al. The impact of breast reconstruction on the delivery of chemotherapy. Cancer 2010;116(7):1791-800.
32. Jin J-M, Bai P, He W, Wu F, Liu X-F, Han D-M, et al. Gender differences in patients with COVID-19: Focus on severity and mortality. medRxiv 2020.
33. Wei X, Xiao Y-T, Wang J, Chen R, Zhang W, Yang Y, et al. Sex Differences in Severity and Mortality Among Patients With COVID-19: Evidence from Pooled Literature Analysis and Insights from Integrated Bioinformatic Analysis. arXiv preprint arXiv:200313547 2020.
34. Brainard JS, Jones N, Lake I, Hooper L, Hunter P. Facemasks and similar barriers to prevent respiratory illness such as COVID-19: A rapid systematic review [Internet]. Available from: medRxiv; 2020:2020. 04.01.20049528.
35. Eikenberry SE, Mancuso M, Iboi E, Phan T, Eikenberry K, Kuang Y, et al. To mask or not to mask: Modeling the potential for face mask use by the general public to curtail the COVID-19 pandemic. Infectious Disease Modelling. 2020.
36. Lin Y-H, Liu C-H, Chiu Y-C. Google searches for the keywords of “wash hands” predict the speed of national spread of COVID-19 outbreak among 21 countries. Brain, Behavior, and Immunity. 2020.
37. Szczesniak D, Ciulkowicz M, Maciaszek J, Misiak B, Luc D, Wieczorek T, et al. Psychopathological responses and face mask restrictions during the COVID-19 outbreak: Results from a nationwide survey. Brain, behavior, and immunity. 2020:S0889-1591(20)30847-3.
38. Runge P. Not all Face Masks are Created Equal-What is Best for You. Dental

Assistant ProQuest Health and Medical Complete. 2005: (74)4.