

*Original Research Article*

# An Analysis of Volunteering Benefits and Obstacles among Health Sector Students during COVID-19 Vaccination in Al-Ahsa, Kingdom of Saudi Arabia

Ola Mousa<sup>\*</sup>, Zenab H. Almussallam, Rana A. Almoussa, Hadeel N. Alabdurab Alredha,  
Noor M. Alsrehed, Ghadeer T. Alhassan

## Abstract

College of Applied medical Sciences,  
King Faisal University, Saudi Arabia

\*Corresponding Author's E-mail:  
[olaessam1977@yahoo.com](mailto:olaessam1977@yahoo.com)

Volunteering is highly beneficial for health sector students to open up new opportunities, to develop their skills, and to gain new ones. In response to the human nature to the call of helping others and the community during COVID-19 pandemic, not a few numbers of health sector students were volunteering in COVID-19 vaccination centers for many purposes. Our research aimed to identify the obstacles hindering health sector students from volunteering and the motivating factors behind their engagement in health volunteering programs to support the vaccination centers in AlAhsa. An online survey was used to collect the participants' data including two sections. The first section includes demographic details and information about the participants. The second part of the survey analyzed the benefits and the obstacles they face. According to a sample of 385, majority of students strongly agreed that they volunteered to gain and improve practical skills, have a new experience, help others, and develop their personal skills. In general, university commitments are considered as a major obstacle for student volunteers. In conclusion, volunteering has many benefits as reported by the participants. Improving practical skills was the main benefit that students were looking for during volunteering. Some volunteers come forward simply for fun and others to fill their free time. The primary obstacle they cited was university commitments. Several volunteers cited the distance between the volunteer center and the house as an obstacle, coupled with the long hours they spent in volunteering. Providing more volunteering opportunities during vacation is recommended to encourage more students to volunteer.

**Keywords:** COVID-19, Health Volunteering, Volunteering Barriers, Volunteering Benefits, Volunteering Opportunities

## INTRODUCTION

The COVID-19 pandemic is the greatest global health threat of our time, and the greatest challenge the health system has ever faced (Tempski, 2021). A case of unknown pneumonia was reported in Wuhan City, China, on 31 December 2019. WHO has established that the outbreak is triggered by a novel coronavirus (nCoV) by 2020 (WHO, 2020). MERS-CoV is a virus with a wide clinical spectrum, from no symptoms to severe acute

respiratory disease and death in case of infection. Coronaviruses (CoV) are a large group of viruses. At the beginning of the pandemic, no vaccine or specific treatment was available. Later, vaccines and treatments for MERS-CoV were being developed (MOH, 2021, WHO, 2019). The number of cases globally is raised to reach 82 million by the end of 2020. At the end of December, 2020, WHO reported near to 500,000

confirmed cases in AlAhsa, including many deaths (Ministry Statistics, 2021). Saudi Ministry of Health (MOH) stated that the targeted groups for vaccination are in three stages according to age and health condition Saudi Arabia's Ministry of Health has stated that vaccinations will help to restore herd immunity (MOH, 2021).

As a result of the COVID-19 pandemic, there was a shortage of medical staff (Shi et al., 2021, Healthcare Workers, 2020). Considering the shortage of staff, numerous competent healthcare professionals and health sector students are needed to reinforce the vaccine center by providing proper vaccine storage, handling, preparation, and administration, as well as answering customers' questions and concerns (CDC, 2021). Therefore, the Saudi government had a health volunteering program (MOH, 2018) and utilized it extensively during the pandemic.

Recently, volunteering, and the crucial role it plays in supporting the community, has been increasingly gaining attention from the general public (Flennert, 2019). Such increasing attention is not surprising. Volunteering is an activity performed by great numbers of individuals across all age categories and involves a considerable number of efforts and activities. In the present study, we focused on formal volunteering and excluded informal volunteering (Morrow-Howell, 2009). The value of volunteers to society is critical and unquestionable. Volunteers supply the core for many social and community programs: without volunteers, many –if not most– social and community programs would come to an end (Burns et al., 2006).

During the pandemic, the government appealed to the hospitals' need for extra manpower. Therefore, they sought this help from the citizens participating in health volunteering program to aid and support the health organizations. According to health volunteering, this program provided extra training to enable these individuals to volunteer within the MOH which involved providing assistance to healthcare workers in hospitals, or outside the MOH such as in isolation or vaccine centers.

Volunteering for the health sector and the role of medical students in combating this epidemic is controversial, and there exists no consensus on how to utilize them most effectively (Drexler, 2020). Although, healthcare students were found to be highly motivated to volunteer in vaccine centers. Such volunteers often include physicians, nurses, pharmacists and other health sector students (Rovers et al., 2016).

A recent study has shown that the medical students are enthusiastic about making a significant contribution to COVID-19 and do not wish to be overlooked. Moreover, the current pandemic presents novel educational opportunities for medical students (Drexler, 2020).

Volunteering reflects the human sense of giving good to others and gives chances to students to support and

assist their community. As shown in the 2030 vision, the kingdom of Saudi Arabia's attention came in the reinforcement of enhancing the number of volunteers, especially in the health sector. As a result of opening opportunities for students to help their communities, the vaccine centers are full of volunteers. Even though healthcare volunteers will gain benefits, they still face some obstacles which will be mentioned in the study (SPSC, n.d).

Vaccine centers in Al Ahsa are seeing an increase in volunteers, and it is crucial to encourage volunteering. Therefore, this study aimed to determine the benefits and obstacles of volunteering at COVID-19 vaccine centers in Al-Ahsa.

### **Specific Objectives**

1. To identify the most common obstacles and barriers that medical students face during volunteering in COVID-19 vaccine centers.
2. To determine the benefits and awards of volunteering in COVID-19 vaccine centers.

### **METHODOLOGY**

#### **Study Area/Setting**

COVID-19 vaccine centers in Al-Ahsa. There were two main COVID-19 vaccine centers in Al-Ahsa, as well as more than 20 secondaries.

#### **Study Subjects**

The study included undergraduate students in the School of Medicine, School of Dentistry, School of Applied Medical Sciences, School of Public Health, or School of Nursing at governmental and private universities in Saudi Arabia who volunteered at the COVID-19 vaccine centers at Al Ahsa.

#### **Study Design**

An exploratory cross-sectional study was conducted to assess the students' experiences in the COVID-19 vaccination centers in Al-Ahsa, and to study the benefits and barriers of volunteering.

#### **Sample Size and Sampling Technique**

Based on the assumption that 50% of medical students' volunteer at COVID-19 vaccine centers in Al-Ahsa, a sample size of 385 was collected, with a non-response

rate of 10%. Researchers included all medical students who volunteered in vaccine centers for COVID-19. Medical students were surveyed online by the researchers. The online questionnaire was initiated on 12 July 2021 and remained open for 15 days.

### Data Collection methods, instruments used and measurements

An online survey was divided into two sections. The first section includes demographic details and information about the participants. The second section was measured by a likerscale (strongly effective, effective, neutral, ineffective, strongly ineffective) to assess the benefits and the obstacles that they cope with.

### Data Management and Analysis Plan

The statistical package for social sciences (SPSS) was used to analyze the data. The descriptive data was presented in tables, graphs, and charts.

### Ethical Considerations

Informed consent and permission were obtained after explaining the objectives and aim of the study to the medical students who volunteer in the COVID-19 vaccine centers. Respondents were kept anonymous, and confidentiality was maintained. Furthermore, they were free to leave the study at any time. It was also reassured to them that not participating in the study would have no impact on their status. In addition, data was kept secured and available only to research purpose.

## RESULTS

This study included 385 student and intern participants from various health colleges in Saudi Arabia. Many participants from many universities volunteer in Al Ahsa because they are affiliated with this community.

Table (1) illustrates the socio-demographic data of the participants. Of the 385 respondents 24.4% males have volunteered, compared with 75,6% of females. In relation to the academic year, more than one-quarter of the participants 105 (27.3%) were from third academic year in the health college. Nursing students were found to have a higher percentage of volunteering 146 (37.9%), followed by medicine students 111 (28.8%).

Table (2) demonstrates that students who have a family member who has volunteered before were more likely to volunteer by a percentage 211(54.8%). The study also found that 355 (92.2%) of participants volunteered to get benefits from this opportunity, followed

by 287 (74.5%) who volunteered simply to fill their free time, and 238 (61.8%) who volunteered for fun. About 167 (43.4%) of respondents reported that volunteering opportunities changed with the season. In the study, it was found that students were more likely to search for volunteer opportunities on social media 311 (80.8%), asking friends 271 (70.4%) and searching through volunteer platforms 270 (70.1%). In addition, 207 (53.9%) of the volunteers have accumulated more than 100 hours of volunteering.

Table (3) shows the percentages of benefits attributed to volunteering and their impact on participants' decision to volunteer during COVID-19. The majority of participants 329(85.5%) strongly agree that they had a new experience. The majority of the participants, 317 (82.3%), strongly agreed that self-development is the most important benefit from volunteering work. There are 312 participants (81%) who strongly believe that volunteering benefits others. The majority of participants 294 (76.4%) believed volunteering would build and develop their CV. The majority of participants 300 (77.9%) believed volunteering would improve their communication skills. Many participants 304 (79%) believed volunteering would improve how effectively they used their free time.

Table (4) displays the percentages of obstacles and the effect that they have on the participants' decision to volunteer during COVID-19. University and studying commitments take the highest percentage of barriers with 225(58.4%), followed by distance between the volunteer center and the house with 166(43.1%), and transportation with 162(42.1%). It was found that 82(21.3%) of the parents' refusal does not influence the decision to volunteer, followed by, the atmosphere (working with the other gender, unfairness, hard contacting with leaders) with (19.5%) and lastly, long volunteering hours 54(14%).

## DISCUSSION

This study aimed to investigate the benefits and obstacles that influence medical students during volunteering at COVID-19 vaccine centers in Al-Ahsa. According to this study volunteering has both personal and professional benefits for participants. The volunteering situation in Al Ahsa was analyzed. A high level of volunteerism was observed across the sampled area. This finding could be seen as a positive by educational institutions and governments that aim to encourage student and youth volunteering.

This research complements and assists the Saudi Arabia 2030 vision, which aims to promote volunteerism among young people. The government also looks at universities as partners in development by offering services and volunteering. Volunteering plays a significant role in social interactions.

It is not uncommon for volunteers to expect benefits

**Table 1.** Sociodemographic Characteristics

Item name	Number	Percent
<b>Sex</b>		
Male	94	24.4%
Female	291	75.6%
<b>Academic year</b>		
Preparatory Year	30	7.8%
1ST YEAR	65	16.9%
2ND YEAR	89	23.1%
3RD YEAR	105	27.3%
4TH YEAR	54	14%
5TH YEAR	14	3.6%
6TH YEAR	6	1.6%
Intern	22	5.7%
<b>Major/ Specialty</b>		
Nursing	146	37.9%
Public Health	46	11.9%
Medicine	111	28.8%
Dentistry	10	2.6%
Emergency Medical services	2	0.5%
Respiratory Therapy - Respiratory Care	9	2.3%
Radiological Sciences	2	0.5%
Clinical Laboratory Sciences	4	1%
Health Informatics	5	1.3%
Health Information Management and Technology	1	0.3%
Clinical Nutrition	11	2.9%
Clinical Pharmacy	35	9.1%
Physical Therapy	1	0.3%
Occupational Therapy	1	0.3%
Cardiac Technology	1	0.3%

**Table 2.** The predictors for volunteering during COVID-19 pandemic among health students and interns

Items	Number	Percent
<b>Do you have a family member who has volunteered before?</b>		
Yes	211	54.8%
No	174	45.2%
<b>Do you think that volunteering will benefit you?</b>		
Yes	379	98.4%
No	6	1.6%
<b>Are there enough volunteering opportunities in your area?</b>		
Yes	135	35.1%
No	83	21.6%
Seasonal opportunities	167	43.4%
<b>what is your main purpose of volunteering?</b>		
To get benefits	355	92.2%
To fill the free time	287	74.5%
To have fun	238	61.8%
To get away from stress	140	36.4%
To meet friends	139	36.1%
Other	37	8.1%
<b>From where you search for volunteering opportunities?</b>		
Official volunteer platforms	270	70.1%
Social media	311	80.8%
University	152	39.5%
Friends	271	70.4%
Family	43	11.2%
Ads	119	30.9%
<b>How many volunteering hours do you have?</b>		
	Number	Percent
Less than 100 hours	178	46.2%
More than 100 hours	207	53.9%

**Table 3.** Volunteering benefits perceived by undergraduate health students and interns

How would you rate the following benefits and their impact on your decision to volunteer during COVID-19?	Number				
	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Gaining social relationships	225 (58.4%)	95 (24.7%)	43 (11.2%)	12 (3.1%)	10 (2.6%)
Building and developing the CV	294 (76.4%)	64 (16.6%)	18 (4.7%)	6 (1.6%)	3 (0.78%)
Gaining and improving practical skills	311 (80.8%)	58 (15.1%)	12 (3.1%)	2 (0.5%)	2 (0.5%)
Gaining and improving communication skills	300 (77.9%)	65 (16.9%)	18 (4.7%)	1 (0.3%)	1 (0.3%)
Effective use of free time	304 (79%)	61 (15.8%)	16 (4.2%)	1 (0.3%)	3 (0.78%)
Having a new experience	329 (85.5%)	39 (10.1%)	15 (3.9%)	1 (0.3%)	1 (0.3%)
Getting rewards	96 (24.9%)	54 (14%)	88 (22.9%)	63 (16.4%)	84 (21.9%)
The good feeling that volunteering gives (such as happiness, self-satisfaction, pleasure, etc.)	286 (74.3%)	73 (19%)	22 (5.7%)	2 (0.5%)	2 (0.5%)
Gaining future job opportunities	206 (53.5%)	91 (23.6%)	69 (17.9%)	10 (2.6%)	9 (2.3%)
Helping others	312 (81%)	51 (13.2%)	19 (4.9%)	3 (0.78%)	0
Self-development (ex: confidence, problem solving... etc)	317 (82.3%)	49 (12.7%)	14 (3.6%)	3 (0.78%)	2 (0.5%)

**Table 4.** Volunteering barriers perceived by undergraduate health students and interns

How would you rate the following obstacles and their impact on your decision to volunteer during COVID-19?	Number				
	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree
Lack of services in the volunteering center	134 (34.8%)	109 (28.3%)	97 (25.1%)	34 (8.8%)	11 (2.9%)
Not having enough training from the organization	137 (35.6%)	89 (23.1%)	76 (19.7%)	53 (13.8%)	30 (7.8%)
Fear of getting Corona virus	90 (23.4%)	82 (21.3%)	92 (23.9%)	68 (17.7%)	53 (13.8%)
Transportation	162 (42.1%)	84 (21.8%)	54 (14%)	39 (10.1%)	46 (11.9%)
The atmosphere (working with the other gender, unfairness, hard contacting with the leaders)	96 (24.9%)	77 (20%)	79 (20.5%)	58 (15.1%)	75 (19.5%)
Fear of making mistakes	87 (22.6%)	127 (33%)	88 (22.9%)	49 (12.7%)	34 (8.8%)
University and studying commitments	225 (58.4%)	79 (20.5%)	51 (13.2%)	16 (4.2%)	14 (3.6%)
The parents' refusal	108 (28.1%)	48 (12.5%)	95 (24.7%)	52 (13.5%)	82 (21.3%)
The distance between the house and the volunteering center	166 (43.1%)	99 (25.7%)	62 (16.1%)	31 (8.1%)	27 (7%)
Long volunteering hours	113 (29.4%)	88 (22.9%)	81 (21%)	49 (12.7%)	54 (14%)

related to volunteering. Study results showed that volunteering is expected to provide benefits. It was in the line with early studies which showed that students expected to benefit from these programs in terms of self-development and employment (Miller et al., 2018). Same age group, same way of thinking may contribute to the same results.

The results of our study included increased diversity awareness and professional development. The results of the study also indicated that volunteering has many benefits, including enjoying the diversity of the work and having fun. In a study in United States, students expected benefits in terms of life and personal skills development as a result of volunteering end (Astin and Sax, 1998). Additionally, Leventhal (2019) demonstrated that volunteering generally improves students' self-confidence as well as their ability to cope with positive outcomes. Perhaps similar results are caused by the same mindset and age group.

In particular, the present study found that the perception of commitment, motivation, and leadership by students had a negative effect on volunteering or appeared as obstacles. The findings of this study are in line with another investigation done in Malaysia which found that universities do not organize volunteer work, and most volunteer work is on an ad hoc basis without much commitment (Hamzah et al., 2011). There could be a connection between the results and the same age group, culture, and community.

In the study, structural barriers were found to be the main obstacles that prevent students from participating in volunteer activities. The most significant structural obstacles that hold students back from getting involved in volunteer activities include time constraints, university studying requirements, and lack of transportation. According to previous research, structural barriers are a significant barrier that prevents students from participating in volunteer activities. The students them-

selves are not able to prevent structural barriers from occurring due to the fact that they are outside their control (Gombe, 2015; Noh and Lukman, 2020). Most of the studies conducted in the same area have the same results. Consequently, we believe that volunteering can be achieved despite barriers.

Furthermore, the current study showed that many of the students were involved in volunteerism and looked for a platform to find a volunteer opportunity. Also, many of the students had volunteered in excess of 100 hours. In the present study, students look for volunteer opportunities for many reasons, such as resume building. Researchers have suggested that college students take up new kinds of volunteer work aimed at building resumés (Fényes et al., 2021).

As previously reported in previous Haski studies, students should ask the right questions prior to volunteering to be better informed of the purpose and benefits of volunteering (Haski-Leventhal, 2019).

## CONCLUSION

Students who volunteered earned new skills and were able to develop themselves, build their resumes, as well as reinforce values such as unselfishness, public service, and (professional) solidarity that are central to the medical ethic. In contrast, the most popular obstacle for volunteering is a structural one. In conclusion, volunteering has many benefits as reported by the participants. Improving practical skills was the main benefit that students were looking for during volunteering. Some volunteers volunteer simply for fun and others to fill their free time. The primary obstacle they mentioned was university commitments. Several volunteers cited the distance between the volunteer center and the house as an obstacle, coupled with the long hours they spent volunteering. Based on the study's conclusion, students' voluntary service during the Coronavirus pandemic may have contributed to service learning and self-development. Providing more volunteering opportunities during vacation is recommended to encourage more students to volunteer.

## Data Availability

Data on which this article is based will be made available to readers without undue delay by the authors.

## Conflict of Interest

This research was conducted with no commercial or financial relationships that could be construed as a potential conflict of interest.

## ACKNOWLEDGEMENT

The authors wish to thank all their volunteers who participated in the study. We would like to also acknowledge Ms. Mariam Mohammed Alduhailan for helping in data collection.

## REFERENCES

- Astin AW, Sax Linda J, "How Undergraduates Are Affected by Service Participation" (1998). *Higher Education*. Paper 7. <http://digitalcommons.unomaha.edu/scehighered/7>
- Burns DJ, Reid JS, Toncar M, Fawcett J, Anderson C (2006). Motivations to volunteer: The role of altruism. *International Review on Public and Nonprofit Marketing*, 3(2), 79–91. <https://doi.org/10.1007/bf02893621>.
- CDC (2021). Centers for Disease Control and Prevention. *Training and Education for COVID-19 Vaccination*. <https://www.cdc.gov/vaccines/covid-19/training-education/index.html>
- Centers for Disease Control and Prevention (CDC). (2020). *Healthcare Workers*. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/mitigating-staff-shortages.html>
- Domaradzki J, Walkowiak D (2021). Medical Students' Voluntary Service During the COVID-19 Pandemic in Poland. *Frontiers in public health*, 9, 618608. <https://doi.org/10.3389/fpubh.2021.618608>
- Drexler R, Hambrecht JM, Oldhafer KJ (2019). Involvement of Medical Students During the Coronavirus Disease Pandemic: A Cross-Sectional Survey Study. *Cureus*. 2020 Aug 30;12(8): e10147. doi: 10.7759/cureus.10147. PMID: 33014645; PMCID: PMC7526758.
- Fényes H, Pusztai G (2012). Volunteering among higher education students. Focusing on the micro-level effects on volunteering. *J Soc Res Policy*. 3:73–95. [Google Scholar]
- Flennert M, König HH, Hajek A (2019). The association between voluntary work and health care use among older adults in Germany. *BMC Health Serv Res* 19, 39 <https://doi.org/10.1186/s12913-019-3867-x>
- Gombe SK, Turiman S, Ismi Arif, I, Zohara O (2015). Empowering youth through volunteerism: The importance of global motivating factors. *IOSR J. Humanit. Soc. Sci. (IOSR-JHSS)*, 20(11), 35-39
- Hamzah S. et al., (2011). Knowledge, attitude and spirit of volunteerism among students in public institution of higher learning. <https://www.researchgate.net/publication/260714601>
- Haski-Leventhal D, Kach A, Pournader M (2019). Employee need satisfaction and positive workplace outcomes: The role of corporate volunteering. *Nonprofit and Voluntary Sector Quarterly*, 48, 593-615. doi:10.1177/0899764019829829
- Haski-Leventhal D, Paull M, Young S, MacCallum J, Holmes K, Omari M, Scott R, Alony I (2019). The Multidimensional Benefits of University Student Volunteering: Psychological Contract, Expectations, and Outcomes. *Nonprofit and Voluntary Sector Quarterly*, 49(1), 113–133. <https://doi.org/10.1177/0899764019863108>
- Health Volunteering - *volunteer.srca.org.sa*. health volunteering - common questions. (2020). [https://volunteer.srca.org.sa/Uploads/Q\\_A\\_HealthVolunteering.pdf](https://volunteer.srca.org.sa/Uploads/Q_A_HealthVolunteering.pdf).
- Miller AL, Rocconi LM, Dumford AD (2018). Focus on the finish line: Does high-impact practice participation influence career

- plans and early job attainment? *Higher Education*, 75, 489-506.
- Ministry Statistics. (2021). Retrieved 6 September 2021, from <https://www.moh.gov.sa/Pages/Default.aspx>
- MOH. (2018). *Minister of Health Sponsors Health Volunteering Forum*. Ministry Of Health Saudi Arabia. <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2018-12-05-001.aspx>.
- MOH. (2020). *Health Volunteering Platform at the Forefront of National Digital Initiatives Worldwide*. Ministry Of Health Saudi Arabia. <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2020-10-29-003.aspx>.
- MOH. (2021). *COVID-19 Vaccine*. Ministry Of Health Saudi Arabia. <https://www.moh.gov.sa/en/Ministry/HotTopics/Pages/COVID-19-Vaccine.aspx>.
- MOH. (2021). *Novel Coronavirus (COVID-19)*. Ministry Of Health Saudi Arabia. <https://www.moh.gov.sa/en/HealthAwareness/EducationalContent/Corona/Pages/corona.aspx>.
- Morrow-Howell N, Hong SI, Tang F. Who benefits from volunteering? Variations in perceived benefits. *The Gerontologist*. 2009;49(1):91–102.
- Noh N, M. Lukman. (2020). Volunteerism Declined Among University Students: Why Do They Not Volunteer? *International Journal of Research and Innovation in Social Science (IJRISS)* |Volume IV, Issue X, October 2020|ISSN 2454-6186
- Rovers J, Japs K, Truong E, Shah Y (2016). Motivations, barriers and ethical understandings of healthcare student volunteers on a medical service trip: a mixed methods study. *BMC Medical Education*, 16(1). <https://doi.org/10.1186/s12909-016-0618-0>.
- Saudi Patient Safety Center. (n.d.). SPSC. <https://www.spsc.gov.sa/English/volunteering/Pages/default.aspx>.
- Shi Y, Zhang SE, Fan L, Sun T (2021). What Motivates Medical Students to Engage in Volunteer Behavior During the COVID-19 Outbreak? A Large Cross-Sectional Survey. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.569765>.
- Southby K, South J, Bagnall AM (2019). A Rapid Review of Barriers to Volunteering for Potentially Disadvantaged Groups and Implications for Health Inequalities. *VOLUNTAS: Int. J. Voluntary and Nonprofit Organizations*, 30(5), 907–920. <https://doi.org/10.1007/s11266-019-00119-2>.
- Tempski P, Arantes-Costa FM, Kobayasi R, Siqueira M, Torsani MB, Amaro B, Nascimento M, Siqueira SL, Santos IS, Martins MA (2021). Medical students' perceptions and motivations during the COVID-19 pandemic. *PloS one*, 16(3), e0248627. <https://doi.org/10.1371/journal.pone.0248627>
- World Health Organization. (2019). *Middle East respiratory syndrome coronavirus (MERS-CoV)*. World Health Organization. [https://www.who.int/en/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-\(mers-cov\)](https://www.who.int/en/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov)).
- World Health Organization. (2020). *Listings of WHO's response to COVID-19*. World Health Organization. <https://www.who.int/news/item/29-06-2020-covidtimeline>.