PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	The Effects of the COVID-19 Pandemic on Sleep Health Among Middle Eastern and North African (MENA) Populations: A Systematic Review of the Literature
AUTHORS	Al-Ajlouni, Yazan; Al Ta'ani, Omar; Shamaileh, Ghaith; Mushasha, Rand; Makarem, Nour; Duncan, Dustin

VERSION 1 – REVIEW

REVIEWER	Spurr, Lydia Royal Brompton Hospital
REVIEW RETURNED	25-Sep-2022

GENERAL COMMENTS	There have been several reviews published exploring the impact of COVID-19 on sleep, but this is a population in which more research is warranted, and the explanation in the introduction as to why this is population is of specific interest was reasonably clear. With methodological improvements this work could be a useful addition to the literature. However, the main problem with the submitted manuscript is that there is no explicit statement of the objectives or questions which the systematic review addresses in the main body of the text (an essential element of the PRISMA guidelines). A statement that the review "sought to summarise the existing literature" is very vague and does not help determine what specific question or objective the work aimed to answer. Further to this, it is confusing as to whether this work is investigating effects on sleep of the pandemic e.g. lockdowns, social distancing etc., or of those with COVID-19 infection (both have been reported in the results section). Finally, given that the clinical, epidemiological, and social effects/restrictions have significantly changed during the pandemic, it is unclear what time point(s) the review relates to (particularly as the vast majority of studies were cross-sectional), but which are likely to have had effects on the reported impact on sleep. Further evaluation of the manuscript is provided in the attached file.

REVIEWER	Wang, Xingyou LifeMine Therapeutics, Biochemistry and Biophysics
REVIEW RETURNED	07-Oct-2022

GENERAL COMMENTS	In this manuscript, Duncan et al. review the effects of the COVID-19 pandemic on sleep health among Middle Eastern and North African populations. The overall observation is that the pandemic has a negative impact on the sleep duration and quality of different groups of people. The authors suggested relevant policies or interventions should be considered to prevent exacerbation of people's sleep health.

	It is nice to have this review in this field. However, there are several concerns that need to be addressed as outlined below.
	Major points:
	1. The manuscript needs a clearer logic line. The authors summarized the results of how sleep changed in different groups of people. However, it is also necessary to relate the sleep changes to COVID-19. More details about the COVID-19 policies and status in MENA countries might help readers understand the causes.
	2. The authors need to clarify the effect on sleep health of which aspect of COVID-19 they want to review: the pandemic or the disease itself. In section 3.4.1, they compare the COVID-19 patient with other people, which might confuse readers.
	3. A map figure with summarized data is needed instead of repeating results from papers.
	Minor points:
	1. Need to rephrase the sentence on Page 9 lines 39 -41. It is not clear what information they are trying to deliver.
	2. Page 9 line 41: "In a Turkey-based study" should be "in a Turkey-based study"
	3. Page 13 line 13: get rid of the "?"
	4. Page 13 line 27: "Finally, and among people…": get rid of "and"
	5. Page 13 line 34: "Furthermore, and in addition…": get rid of "and"
	6. Page 13 line 45: get rid of "." before "Similarly"

REVIEWER	Jahrami, Haitham Arabian Gulf University
REVIEW RETURNED	11-Oct-2022

GENERAL COMMENTS	dear authors thank you very much for this manuscript. Middle East and North Africa =MENA correct line 39 data analysis section is completely missing type of transformation and modelling. i suggest you add one more analysis which is a meta-regression of % of native country e.g. % saudi in saudi paper this will take paper to higher level (optional) authors who drafted methods and results completely different from those who wrote introduction and discussion the flow and terms need recheck

VERSION 1 – AUTHOR RESPONSE

REVIEWER #1
There have been several reviews published exploring the impact of COVID-19 on sleep, but this is a population in which more research is warranted, and the explanation in the introduction as to why this is population is of specific interest was reasonably clear (p.4 from line 39). With methodological improvements this work could be a useful addition to the literature.

1. **The main problem is that there is no explicit statement of the objectives or questions which the systematic review addresses in the main body of the text (an essential element of the PRISMA guidelines). A statement that the review "sought to summarise the existing literature" is very vague and does not help determine what specific question or objective the work aimed to answer.**

Response: We thank the reviewer for this comment. In our revised manuscript we are submitting, we have addressed this issue and reworked our objective statement to explicitly mention that this review is investigating the association between COVID-19 induced national lockdowns (e.g., and the changes this introduced to people's lifestyles) and different domains of sleep health, including sleep duration, quality, and problems. Additionally, we have reviewed the manuscript to ensure that the objectives are mentioned explicitly without vagueness where appropriate.

2. **Further to this, it is confusing as to whether this work is investigating effects on sleep of the pandemic, or of those with COVID-19 infection (both have been reported in the results section).**

Response: We thank the reviewer for this note. In our revised manuscript, we have edited the text and the data to reflect that this work is investigating effects of COVID-19 induced lockdowns around the MENA region with sleep health, among the general population (e.g., not among those infected with COVID-19 specifically). We agree that this clarification is necessary and believe that thanks to your comment, the manuscript is more coherent in its objectives and data.

3. **Finally, given that the clinical, epidemiological, and social effects/restrictions have significantly changed during the pandemic, it is unclear what time point(s) the review relates to (particularly as the vast majority of studies were cross-sectional), but which are likely to have had effects on the reported impact on sleep. A statement on how similar or different the quarantine/social distancing requirements were amongst MENA countries would also help to put the work in context, as would some information on the time scales at which vaccination started (if available).**

Response: We thank the reviewer for this very important comment. The authors agree that clarifying the unique quarantine requirements within each country is an important consideration when interpreting the results of our review. Unfortunately, the literature is lacking regarding this information. In our revised manuscript, we have added this note as a limitation of our study, which we think is important to consider when interpreting our results.

4. **The literature referenced in the introduction is described as 'emerging' however in the context of the speed at which research related to COVID-19 was conducted during the pandemic, some of the references are now more established than emerging, and a wide body of evidence is now available which should be discussed in more depth to put the study in context.**

Response: We thank the reviewer for this note. In our revised manuscript, we have edited the terminology used in this section to describe the research present in the literature. Additionally, we have added further references in our revised manuscript.

5. **Beyond this, a description of normal sleep patterns in MENA countries would be helpful (e.g., is daytime sleep, which is later referenced in the results section, common?).**

Response: The authors agree with the reviewer regarding the value of this information in the context of our paper. Unfortunately, such data is lacking in the literature, as the MENA region continues to be severely understudied in public health research and particularly sleep health research. We have noted this recommendation in future research section of our paper.

6. **p. 5 line 16 specifically says that this review was investigating adults, however the abstract and subsequent results also include paediatric populations.**

Response: We thank the reviewers for this comment. We have edited this line in our revised manuscript.

7. **p. 4 line 15 references Park et al. but there does not appear to be a reference in the list for this study.**

Response: This reference has been added. We thank the reviewer for this note.

Methods:

8. **P.6 line 8 states "we conducted a systematic literature review on multiple databases, including…" however, the 5 databases listed appear to be the only ones used in the results section. If this is the case, this should be stated in the methods rather than implying additional databases were searched.**

Response: We thank the reviewer for this comment and agree. The sentence has been edited to now imply that only those five databases were utilized in our search, in line with the PRISMA figure we also submit.

9. **Were previous systematic reviews of sleep in relation to the COVID-19 pandemic (of which there are several) critically appraised as part of the work or preparation of the manuscript?**

Response: Indeed, prior to conducting our systematic search, the authors conducted a literature search to identify such systematic reviews that have been published in the literature. Such reviews were referenced in both our introduction and discussion section. In our revised manuscript, we have added this information in our methodology section to report that this was done. We thank the reviewer for pointing this out.

10. **I am unclear as to what types of studies were considered and included. Were they only studies with numerical data presented or were qualitative studies included? Were there any limitations on the types of studies included e.g. narrative reviews, other systematic-reviews? Were there limitations on the publication dates of the studies included/excluded? Was there a rationale behind only including studies with >100 participants? Currently this appears an arbitrary cut off.**

Response: We thank the reviewer for this comment. In our revised manuscript, we have included further details regarding the inclusion and exclusion criteria (e.g., both qualitative and quantitative studies were included; systematic and narrative reviews were excluded; date of publication within our criteria). Regarding the exclusion of studies with less than 100 participants, the rational was to exclude pilot studies with insufficient sample sizes and therefore limited power to detect any associations.

11. **As several of the studies used similar tools to assess sleep e.g. ISI, PSQI, is there any scope for presenting data that combines or compares results where these have been used?**

Response: We thank the reviewer for this valuable suggestion. While many studies used similar tools to assess sleep, our data collection has shown that many studies measured/reported different sleep health domains (e.g., either sleep duration, sleep problems, and/or sleep quality). Additionally, the findings of such domains were reported across different unique sub-populations (e.g., adults, students, HCWs, etc). Consequently, given this variation in results albeit using the same tool to measure, this created a challenge in data presentation and we opted to report the results per sub-population as shown in our review. Despite reporting what methods were used to measure sleep, we acknowledge the limitation of not making direct comparisons between different studies using similar tools, which has been noted in our future research directions.

12. **In studies that included several or 'global' populations, were results specifically pertaining to MENA populations isolated for use in this systematic review?**

Response: When extracting data from such studies, we only reported results specifically pertaining to MENA populations. Studies that did not report results explicitly from the MENA region (e.g., grouped different countries/regions together) were excluded from this review.

13. **I am unclear about how the sub-populations of MENA populations were identified – was this done in advance (I note that no specific sub-group analyses were planned in the PROSPERO entry), or did it occur during data analysis?**

Response: We thank the reviewer for this note. The sub-group analyses were identified and decided upon by the authors after data collection. While the PROSPERO application did not specify an initial sub-population analysis, the methodology section of our paper outlines that the sub-populations were

identified upon data collection. This section in our manuscript has been revised to ensure it reflects this information clearly.

14. Given that the NOS was used only for cross-sectional studies, how was risk of biased assessed for the 8 longitudinal studies? Were any studies excluded as a result of the NOS assessment?

Response: We thank the reviewer for this comment. No studies were excluded as a result of the NOS assessment, and all studies identified through our systematic search of the literature were included, assessed, and reported, in an attempt to capture the literature regarding the topic. Given that almost all studies were cross-sectional, we opted to use a cross-sectional bias assessment tool for standardization and did not conducted risk bias for the 8 longitudinal studies included in our review.

15. It would also be helpful to provide a summary or statement about how sleep was assessed in the studies included (I appreciate these are also included in the summary table but as there are >100 studies included, a summary would be appreciated).

Response: We thank the reviewer for this comment. In our discussion section, particularly in the limitations and future research sub-section, we have included a summary sentence that captures this information succinctly. More specifically, we mentioned that the majority of studies measured sleep using PSQI, as well as other subjective measures that may have not been validated within the literature. Additionally, we note the absence of any study that may have used objective tools for sleep measurement (e.g., actigraphy).

Results:

16. The section on healthcare workers feels the most informative and cohesive as a set of results. However, in general the results are difficult to interpret and appear superficial in the context of the large amount of data analysed – they appear presented as a brief summary of some of the studies included. In particular, statements are referenced usually with only one study which makes inferring consistency or differences between them difficult. E.g., p.9 line 9 has a broad statement regarding consistency of results across Middle Eastern adults, but then gives results from one specific source. Again, a drawback of the results presented are that there is little context or analysis provided regarding the point at which studies were conducted during the pandemic. There are also some instances e.g., line 5 p.12 in which I cannot determine which studies are being references (particularly where results may be surprisine.g., Narcolepsy being reported as the most common sleep disorder among medical students in Saudi Arabia).

Response: We thank the reviewer for this very valuable note. In our revised manuscript, we have made substantial edits to our results section. Where appropriate, we added further citations and reviewed our references in line with statements that report results. In line with our study design and plan for data representation, we sought to qualitatively report the findings within the literature. In our revised manuscript, we have also added commentary regarding demographic and socioeconomic differences relating to sleep health outcomes, which we believe enhanced the quality of the results section and the manuscript as a whole.

Discussion:

17. Is there meant to be a '?' in p. 13 line 13?

Response: We thank the reviewer for this note, this sentence has now been edited.

18. To make more of an impact of these results, I would suggest further exploration and comparison of the several systematic reviews and meta-analyses that have been conducted to explore sleep and the COVID-19 pandemic in other populations, in comparison to MENA populations. Although very important to be discussed and researched, there is some confusion in the discussion about whether this work relates to the COVID-19 pandemic, or the wider issue of sleep in MENA populations – although the specific issues that may exacerbate sleep problems or their biological or psychosocial outcomes are discussed, there is little clear connection with the results of the systematic review.

Response: We thank the reviewer for this comment, which has provided valuable guidance in revising our discussion section. In our resubmitted manuscript, we have addressed key issues in our discussion. This includes further association(s) between our findings and possible mechanism(s) in which they occur among the population, as well as a commentary on the status of sleep health among MENA populations in the literature prior to the pandemic. Not only has this provided extra depth to our discussion section, but it also improved our recommendations for future research to ensure that such an understudied population can be adequately and strategically studied in health research. Thank you.

19. Similarly, the conclusion needs further work to draw together the aims of the research with the results presented.

Response: We thank the reviewer for this comment. In our revised manuscript, we have edited parts of the conclusion to explicitly discuss the main finding within the context of a clearly stated aim. Additionally, we ensured that the very brief conclusion includes next steps in future research to ensure the continuity of this work on this important topic.

Grammar:

20. There are a few grammatical issues through the manuscript, and please ensure abbreviations are used consistently (e.g., MENA in line 21 p. 5) where they have previously been used in the manuscript. Newcastle Ottawa Scale (NOS) – line 25 p3

Response: We thank the reviewer for this comment. Our revised manuscript has been reviewed thoroughly by two independent language reviewers to ensure smooth flow and coherent readability, as well as to address grammatical errors like these ones, which we believe have improved the quality of our manuscript.

REVIEWER #2

In this manuscript, Duncan et al. review the effects of the COVID-19 pandemic on sleep health among Middle Eastern and North African populations. The overall observation is that the pandemic has a negative impact on the sleep duration and quality of different groups of people. The authors suggested relevant policies or interventions should be considered to prevent exacerbation of people's sleep health.

It is nice to have this review in this field. However, there are several concerns that need to be addressed as outlined below.

1. The manuscript needs a clearer logic line. The authors summarized the results of how sleep changed in different groups of people. However, it is also necessary to relate the sleep changes to COVID-19. More details about the COVID-19 policies and status in MENA countries might help readers understand the causes.

Response: We thank the reviewer for this very important comment. The authors agree that clarifying the unique quarantine requirements within each country is an important consideration when interpreting the results of our review. Unfortunately, the literature is lacking regarding this information. In our revised manuscript, we have added this note as a limitation of our study, which we think is important to consider when interpreting our results. Additionally, where appropriate, we amended some statements to reflect the relationship of sleep health outcomes to COVID-19 outcomes and relate them to the physical and psychological burden of quarantine measures globally.

2. The authors need to clarify the effect on sleep health of which aspect of COVID-19 they want to review: the pandemic or the disease itself. In section 3.4.1, they compare the COVID-19 patient with other people, which might confuse readers.

Response: We thank the reviewer for this note. In our revised manuscript, we have edited the text and the data to reflect that this work is investigating effects of COVID-19 induced lockdowns around the MENA region with sleep health, among the general population (e.g., not among those infected with COVID-19 specifically). We agree that this clarification is necessary and believe that thanks to your comment, the manuscript is more coherent in its objectives and data.

3. A map figure with summarized data is needed instead of repeating results from papers.

Response: We thank the reviewer for this suggestion. We have attempted multiple modelling and visualization of the data. Given the heterogeneity of the data reported (e.g., multiple sleep health domains among multiple sub-populations in over 20 countries), it was difficult to find one domain that can be compared across all countries. Additionally, and given that the studies included in this review did not control for natives within one specific country (e.g., studies were conducted among the population residing in Saudi Arabia vs. among only Saudi nationals), the authors agreed that a map representing the percentage of natives within a country may be misleading in relation to the results we presented. Consequently, the choice of qualitatively reporting the data was made in order to be able to capture the widest scope of evidence regarding this very understudied in the literature. We hope that throughout this approach we are able to provide rich foundation of data for future research to build on, which is essential considering this population's underrepresentation in health research.

4. Minor points:
- **Need to rephrase the sentence on Page 9 lines 39 -41. It is not clear what information they are trying to deliver.**
- **Page 9 line 41: "In a Turkey-based study" should be "in a Turkey-based study"**
- **Page 13 line 13: get rid of the "?"**
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- **Page 13 line 34: "Furthermore, and in addition…": get rid of "and"**
- **Page 13 line 45: get rid of "." before "Similarly"**

Response: We thank the reviewer for these comments and pointing out those errors. We have addressed them in our revised manuscript.

REVIEWER #3

Dear authors thank you very much for this manuscript.

1. Middle East and North Africa = MENA correct line 39

Response: We thank the reviewer for this comment and note that it has been corrected.

2. Data analysis section is completely missing type of transformation and modelling. I suggest you add one more analysis which is a meta-regression of % of native country e.g. % saudi in saudi paper this will take paper to higher level (optional)

Response: We thank the reviewer for this suggestion. We have attempted multiple modelling and visualization of the data. Given the heterogeneity of the data reported (e.g., multiple sleep health domains among multiple sub-populations in over 20 countries), it was difficult to find one domain that can be compared across all countries. Additionally, and given that the studies included in this review did not control for natives within one specific country (e.g., studies were conducted among the population residing in Saudi Arabia vs. among only Saudi nationals), the authors agreed that a map representing the percentage of natives within a country may be misleading in relation to the results we presented. Consequently, the choice of qualitatively reporting the data was made in order to be able to capture the widest scope of evidence regarding this very understudied in the literature. We hope that throughout this approach we are able to provide rich foundation of data for future research to build on, which is essential considering this population's underrepresentation in health research.

3. Authors who drafted methods and results completely different from those who wrote introduction and discussion the flow and terms need recheck

Response: We thank the reviewer for this comment. Our revised manuscript has been reviewed thoroughly by two independent language reviewers to ensure smooth flow and coherent readability, which we believe have improved the quality of our manuscript.