EXTENDED REPORT


ABSTRACT

Objectives We used findings from the Global Burden of Disease Study 2013 to report the burden of musculoskeletal disorders in the Eastern Mediterranean Region (EMR).

Methods The burden of musculoskeletal disorders was calculated for the EMR’s 22 countries between 1990 and 2013. A systematic analysis was performed on mortality and morbidity data to estimate prevalence, mortality, and years lived with disability and disability-adjusted life years (DALYs).

Results For musculoskeletal disorders, the crude DALYs rate per 100 000 increased from 1297.1 (95% uncertainty interval (UI) 924.3–1703.4) in 1990 to 1606.0 (95% UI 1141.2–2130.4) in 2013. During 1990–2013, the total DALYS of musculoskeletal disorders increased by 105.2% in the EMR compared with a 58.0% increase in the rest of the world. The burden of musculoskeletal disorders as a proportion of total DALYs increased from 2.4% (95% UI 1.7–3.0) in 1990 to 4.7% (95% UI 3.6–5.8) in 2013. The range of point prevalence (per 1000) among the EMR countries was 28.2–136.0 for low back pain, 27.3–49.7 for neck pain, 9.7–37.3 for osteoarthritis (OA), 0.6–2.2 for rheumatoid arthritis and 0.1–0.8 for gout. Low back pain and neck pain had the highest burden in EMR countries.

Conclusions This study shows a high burden of musculoskeletal disorders, with a faster increase in EMR compared with the rest of the world. The reasons for this faster increase need to be explored. Our findings call for incorporating prevention and control programmes that should include improving health data, addressing risk factors, providing evidence-based care and community programmes to increase awareness.

INTRODUCTION
Musculoskeletal disorders have been underestimated and even ignored for a long time, mainly due to their low fatality rate and being viewed as irreversible conditions or simply part of the ageing process. The considerable contribution of musculoskeletal disorders is now more clear and several studies have quantified the prevalence of musculoskeletal disorders. They have not been a focus of public health in low-income and middle-income countries. Musculoskeletal disorders have been underestimated and even ignored for a long time, mainly due to their low fatality rate.

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METHODS
GBD 2013 covers 188 countries, 7 super-regions and 21 regions from 1990 to 2013. In total, 306 causes of diseases and injuries, 240 causes of death and 79 risk factors were systematically analysed. Details on the methodology of GBD studies and the main changes to the methods for GBD 2013 have been explained in previous publications.

There are 22 countries in the EMR by WHO designation with different levels of Gross National Income per capita. The low-income countries are Afghanistan, Djibouti, Somalia and Yemen; middle-income countries: Egypt, Iraq, Iran, Jordan, Lebanon, Libya, Morocco, Pakistan, Palestine, Sudan, Syria and Tunisia; and high-income countries: Bahrain, Saudi Arabia, Kuwait, Oman, Qatar and the United Arab Emirates.

In GBD 2013, the burden from six main categories of musculoskeletal disorders was calculated: rheumatoid arthritis, osteoarthritis, low back pain, neck pain, osteoarthritis, rheumatoid arthritis,.create summary table

### disorders, equivalent ICD-10 codes and list of sequelae for each disorder in the Global Burden of Disease Study

<table>
<thead>
<tr>
<th>0 codes</th>
<th>Sequelae (number of sequelae)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M06.9, M08.0-M08.89</td>
<td>Mild, moderate and severe rheumatoid arthritis (3)</td>
</tr>
<tr>
<td>M13.9, M15-M19.079</td>
<td>Mild, moderate, and severe osteoarthritis of the hip; mild, moderate and severe osteoarthritis of the knee (6)</td>
</tr>
<tr>
<td>G54.3, G54.4, G57.0-G57.12, M43.2-M43.5, M43.9, M45-M49, M49.89, M51-M51.9, M53, M53.2-M54.1, M54.1-M54.18, M54.3-M54.9, M99.1-M99.9</td>
<td>Mild, moderate, and severe most severe low back pain without leg pain; mild, moderate, severe and most severe low back pain with leg pain (8)</td>
</tr>
<tr>
<td>, M50-M50.93, M53.0, M53.1, M54.0-M54.09, M54.2</td>
<td>Mild, moderate, severe and most severe neck pain (4)</td>
</tr>
<tr>
<td>M10.19, M10.3-M10.9</td>
<td>Asymptomatic gout, symptomatic episodes of gout and polyarticular gout (3)</td>
</tr>
<tr>
<td>L93-L93.2, M00-M03.0, M03.2, M03.6, M07-M08, M08.9-M09.0, , M09.8, M11-M12, M12.2- M12.49, M12.8-M12.9, M14-M14.89, M25.879, M30-M32.9, M34-M36.8, M40-M43.19, M65-M68.8, M73, M73.8, M75-M77.9, M80-M83.4, M83.8-M87.09, M87.3-M89.59, M95.9, M99.0-M99.9</td>
<td>Asymptotic other musculoskeletal disorders and other musculoskeletal disorders severity levels 1–6 (7)</td>
</tr>
</tbody>
</table>

Classification of Diseases and Related Health Problems, tenth revision.
0.035) for mild low back pain without leg pain to 0.384 (95% UI 0.256–0.518) for most severe low back pain with leg pain. A complete list of health state descriptions and equivalent disability weights is available in the web appendix of a previous GBD publication.\textsuperscript{21}

In this study, the burden is described as prevalence, deaths, due to premature mortality, years lived disability-adjusted life-years (DALYs), age-standardised rates to be able to distinguish population structure from the different sex-specific rates. Other musculoskeletal disorders (except the category of ‘other musculoskeletal disorder’ to be non-fatal with no mortality and some mortality. To estimate the cause-specific mortality envelopes (total number of deaths) were estimated for each country during 2010. All accessible data from vital registry surveys, sample registration data deaths were considered for preparing of death data was extracted from the sources any available verbal autopsies.\textsuperscript{19} We nsemble modelling \textsuperscript{22} to estimate the burden of rheumatoid arthritis and ‘other musculoskeletal disease, sex, country and year.

We, we updated the GBD 2010 systematic measures for each musculoskeletal strategy to avoid missing sources of ring of the results of systematic reviews of GBD collaborators.\textsuperscript{21} A list of data from the Global Health http://ghdx.healthdata.org/gbd-2013-data

As expected, YLDs were the main component of DALYs for musculoskeletal disorders (>98%, both in 1990 and 2013), and DALY estimates were very close to YLD estimates. The total burden of musculoskeletal disorders was 4,842,603 DALYs (95% UI 3,450,654–6,359,159) in 1990 and increased to 9,946,874 DALYs (95% UI 7,068,174–13,194,791) in 2013, a 105.4% increase in total DALYs of musculoskeletal disorders, compared with a 58.0% increase in the rest of the world. The crude DALY rate per 100,000 increased from 1,297.1 (95% UI 924.3–1,703.4) in 1990 to 1,606.0 (95% UI 1,141.2–2,130.4) in 2013, which shows a 23.8% increase. Age-standardised DALY rates were 2,055.6 (95% UI 1,478.3–2,704.1) in 1990 and increased by 2.9% to 2,115.9 (95% UI 1,517.2–2,799.7) in 2013. The burden of musculoskeletal disorders as a proportion of total DALYs has increased since 1990; the proportion that was 2.4% (95% UI 1.7–3.0) in 1990 increased to 3.2% (95% UI 2.8–4.6) in 2000 and 4.7% (95% UI 3.6–5.8) in 2013. Figure 1 compares the burden of musculoskeletal disorders in the EMR to data for the world, low/middle-income countries and high-income countries. Table 2 summarises DALY rates for each musculoskeletal disorder. As shown, DALY rates have been increased during 1990–2013 for all musculoskeletal disorders, both in men and women.

Egypt had the highest and Lebanon had the lowest age-standardised musculoskeletal disorders DALY rates both for males and females. Ranges of age-standardised DALY rates had a considerable overlap between the low-income, middle-income and high-income countries of EMR (table 3). DALY rates had a clear increasing pattern with age; however, those of middle age had the highest number of DALYs (figure 2). Among different musculoskeletal disorders, low back pain had the highest proportion of DALYs in all age groups. The proportion of osteoarthritis DALYs out of total DALYs of musculoskeletal disorders increased with age. In individuals aged ≥65 years, osteoarthritis was the second important cause of DALYs after low back pain.

The burden of musculoskeletal disorders was higher in females compared with males, except for low back pain and gout. The total burden was 5,415,756 DALYs (95% UI 3,877,474–7,150,503) in females and 4,531,118 DALYs (95% UI 3,924,109–5,138,127) in males. More details are available on the Global Health Mortality and YLDs of musculoskeletal disorders increased from 1279 per 100,000 (95% UI 907–1,686) in 1990 to 1576 (95% UI 1111–2100) in 2013. Musculoskeletal disorders were the second leading cause of YLDs after ‘mental and substance use disorders’ and accounted for 15.7% of all YLDs (95% UI 13.8–17.7%) in 2013. Low back pain and neck pain had the highest YLDs among the disorders (web appendix 1).
Males in 2013. DALY rates were 1800.9 (95% UI 1289.4–2377.7) and 1422.2 (95% UI 1004.5–1891.6) respectively. Figure 3 shows the burden of order by sex in 2013. Gout had a small Lys per 100 000 in women and men, and has not been shown in the figure.

The ratio of age-standardised female to male musculoskeletal DALY rates ranged between 1.02 in Morocco and 2.01 in Iran (table 3). The ratio of age-standardised female to male DALY rates was <1 for gout disease in all countries of the region. For low back pain, the ratio was <1 except for Sudan (1.02), Egypt (1.03), Saudi Arabia (1.15), Lebanon (1.43) and Iran...
Table 3  Age-standardised disability-adjusted life year rates (per 100 000) of musculoskeletal disorders by country and sex in the Eastern Mediterranean Region, 2013

<table>
<thead>
<tr>
<th>Countries</th>
<th>Both Rate</th>
<th>95% UI</th>
<th>Male Rate</th>
<th>95% UI</th>
<th>Female Rate</th>
<th>95% UI</th>
<th>F/M ratio</th>
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<tbody>
<tr>
<td>Low-income countries</td>
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<tr>
<td></td>
<td>2125</td>
<td>1507–2800</td>
<td>1864</td>
<td>1293–2500</td>
<td>2362</td>
<td>1630–3189</td>
<td>1.27</td>
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<tr>
<td></td>
<td>2075</td>
<td>1497–2743</td>
<td>1819</td>
<td>1280–2456</td>
<td>2312</td>
<td>1638–3130</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>1463–2621</td>
<td>1880</td>
<td>1350–2473</td>
<td>2151</td>
<td>1522–2835</td>
<td>1.14</td>
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<td></td>
<td>2848</td>
<td>1989–3863</td>
<td>2459</td>
<td>1692–3335</td>
<td>3201</td>
<td>2256–4309</td>
<td>1.3</td>
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<td></td>
<td>2370</td>
<td>1708–3153</td>
<td>2034</td>
<td>1442–2715</td>
<td>2683</td>
<td>1936–3529</td>
<td>1.32</td>
</tr>
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<td></td>
<td>2352</td>
<td>1683–3108</td>
<td>2318</td>
<td>1650–3123</td>
<td>2370</td>
<td>1692–3114</td>
<td>1.02</td>
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<td></td>
<td>2322</td>
<td>1664–3056</td>
<td>1539</td>
<td>1084–2026</td>
<td>3095</td>
<td>2216–4090</td>
<td>2.01</td>
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<td></td>
<td>2274</td>
<td>1605–3003</td>
<td>2028</td>
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<td>2507</td>
<td>1770–3348</td>
<td>1.24</td>
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<td></td>
<td>2195</td>
<td>1555–2972</td>
<td>1943</td>
<td>1318–2692</td>
<td>2450</td>
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<td>2177</td>
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<td>1862</td>
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<td>2480</td>
<td>1745–3285</td>
<td>1.33</td>
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<td></td>
<td>2040</td>
<td>1438–2728</td>
<td>1880</td>
<td>1289–2590</td>
<td>2165</td>
<td>1531–2905</td>
<td>1.15</td>
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<td></td>
<td>1992</td>
<td>1413–2654</td>
<td>1842</td>
<td>1307–2450</td>
<td>2125</td>
<td>1511–2803</td>
<td>1.15</td>
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<td></td>
<td>1636</td>
<td>1186–2158</td>
<td>1603</td>
<td>1156–2140</td>
<td>1670</td>
<td>1205–2197</td>
<td>1.04</td>
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<td></td>
<td>1287</td>
<td>937–1715</td>
<td>1093</td>
<td>792–1450</td>
<td>1500</td>
<td>1077–2004</td>
<td>1.37</td>
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<tr>
<td>High-income countries</td>
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<tr>
<td></td>
<td>2205</td>
<td>1598–2914</td>
<td>1994</td>
<td>1404–2686</td>
<td>2505</td>
<td>1765–3376</td>
<td>1.26</td>
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<td></td>
<td>2161</td>
<td>1528–2852</td>
<td>1806</td>
<td>1247–2404</td>
<td>2650</td>
<td>1837–3558</td>
<td>1.47</td>
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<tr>
<td></td>
<td>2080</td>
<td>1470–2782</td>
<td>1825</td>
<td>1222–2538</td>
<td>2436</td>
<td>1718–3259</td>
<td>1.33</td>
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<tr>
<td></td>
<td>2078</td>
<td>1485–2764</td>
<td>1914</td>
<td>1318–2587</td>
<td>2499</td>
<td>1788–3323</td>
<td>1.31</td>
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<tr>
<td></td>
<td>2040</td>
<td>1463–2688</td>
<td>1985</td>
<td>1400–2651</td>
<td>2151</td>
<td>1535–2840</td>
<td>1.08</td>
</tr>
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<td></td>
<td>1361</td>
<td>983–1794</td>
<td>1126</td>
<td>809–1469</td>
<td>1741</td>
<td>1254–2298</td>
<td>1.55</td>
</tr>
</tbody>
</table>

The proportion of musculoskeletal disorders’ burden over total burden of disease has even increased. Musculoskeletal disorders are the second leading cause of disability in the EMR. Although population ageing is a main reason for increasing burden of musculoskeletal disorders, a large proportion of the burden is imposed on people in their most active and productive years of life. We did not find a specific association between income level of the country and burden of musculoskeletal disorders; however, the relative importance of risk factors (occupational ergonomic factors compared with high body mass index) was different based on the income level of countries.

Our findings call for incorporating prevention and control programmes for musculoskeletal disorders in national health programmes. COPCORD could be used as a stepwise approach to address the high burden of musculoskeletal disorders; however, previous COPCORD programmes in EMR usually have not progressed beyond the early stages (such as baseline surveys) towards a focus on prevention and control activities. Considering the important risk factors of musculoskeletal disorders, public education, occupational health and safety and ergonomics are among the most important components of any prevention and control programme. Medical interventions and rehabilitation to preserve functional status are essential to provide control of the situation.

Advocacy is required to raise the attention of policy and decision makers to the disease burden caused by musculoskeletal disorders. As a reflection on the previous round of the ongoing GBD study, some experts recommended extensive involvement...
to initiate any intervention for control
orders and integrating services with exist-
ners.\textsuperscript{3} Mody and Brooks suggested new
gies to train community health workers
viders to detect and initiate the man-
rlier stages.\textsuperscript{24}
ents and the entire population, treat-
ventions, prevention through iden-
of environmental and genetic risks are
ventions after primary epidemi-
People with musculoskeletal conditions
m of services including traditional, com-
ve therapies of which ef
ficiencies may not
nt biological medications and surgical
the long-term outcomes of some mus-
uch as rheumatoid arthritis or severe
t can be too expensive to be afford-
imly access to healthcare providers is
f the musculoskeletal disorders. For
with inflammatory disorders such as
ly assessment by a specialist improves
in Lebanon, around a quarter of these
nd of treatment.\textsuperscript{26} On the other hand,
using unnecessary diagnostic or thera-
ple with musculoskeletal symptoms,
er countries. This needs to be avoided
for quaternary prevention.
le factors (such as maintaining physical,
having a balanced diet, avoidance of
consumption, and preventing
injuries) is not only beneficial for musculoskeletal health but
also for other non-communicable diseases that contribute to
creasing mortality and morbidity.\textsuperscript{24}
Low back pain and neck pain have the highest burden of mus-
culoskeletal disorders in most of the EMR countries. In previous
studies, the seven-day period prevalence of pain for dorso-
bar and cervical spine in Iran were 23.7\% and 14.2\%, respect-
. The estimates were higher in rural areas compared with
urban areas, and also in people with specific jobs and pregnant
women.\textsuperscript{29} In Kuwait, the point prevalence of low back pain in
choolchildren aged 10–18 years old was 20.6\% in males and
9.3\% in females.\textsuperscript{30} A cumulative prevalence of around 28\%
for low back pain was reported by children aged 11–19 years
ld in Tunisia.\textsuperscript{31} Some of these estimates cannot be directly
pared with our estimates due to different definitions and
the time interval used for assessment. However, the available
evidence collectively reflects the importance of the problem.
There are several evidence-based public health and clinical
guidelines for low back pain\textsuperscript{32}–\textsuperscript{34} and neck pain,\textsuperscript{35} 36
ually from high-income countries. Development of suitable guidelines
for use in resource-poor settings is challenging. Most research
evidence originates from high-income countries and may not be
levant or applicable to the needs of low-income countries.
Moreover, the development of valid clinical guidelines needs
sources and certain expertise that sometimes is not available.
In the paucity of nationally developed guidelines, EMR coun-
ries can use the available guidelines through adaptation
processes.\textsuperscript{37}
Osteoarthritis is an important cause of disability, especially in
elderly people. It is expected to be influenced by the population
geing process more than other musculoskeletal disorders. Some
evidence suggests that intensive physical activity might increase
large joints; however, this is not a

dings on association of physical activity

usually confusing

at walking and physical exercise has a
earthritis, there are some reviews that

eral individuals can help to reduce

arthritis.39 Light or moderate physical

known to increase risk or complications

activity can also decrease risk of osteo-
g body mass index.38 39 The burden of

disorders’ was around threefold in

fibromyalgia

disorders are more prevalent among

limitations. Although we estimated a col-
culoskeletal disorders in this study, we

e estimations for some of the disorders

and systemic connective tissue disor-

not separately assess the burden of hand

sification of musculoskeletal disorders

ion between symptoms, complaints and

10 codes clarify the components of each

clude osteoporosis as a disease; instead,

y was classified as a risk factor for frac-
e burden has not been shown in this

t provide separate estimates for diseases

such as the Behçet disease, which have regional importance in

EMR or individual (but not collective) high burden.

There were issues with availability and quality of data in some

EMR countries; however, we used GBD modelling approaches

to reduce this issue. Indeed, the lack of high-quality data in the

region, especially from the 1990s, might have an influence on

the estimated trend of musculoskeletal diseases. Although this

issue exists for many of the causes of diseases, it might have an

imbalance effect on musculoskeletal diseases (the importance

of which has been highlighted in the recent decades) compared

with the other diseases. This factor might affect different regions

of the world in different ways. However, we do not believe that

it can purely explain the faster increase in burden of musculo-
skeletal disorders in EMR compared with the rest of the world.

CONCLUSION

Findings from this study show a high burden of musculoskeletal

disorders, especially low back pain, neck pain and osteoarthritis

in the region. The reasons for faster increase of musculoskeletal

disorders’ burden in EMR during 1990–2013 compared with

the rest of the world need to be explored. Our findings call for

integrating prevention and control programmes for musculoskel-
etal disorders with health system programmes. Plans should

include improving health data to monitor trends, addressing

known risk factors especially through health education and

awareness, ergonomics and occupational health and safety, and
Clinical and epidemiological research

providing evidence-based early diagnosis and treatment, rehabilitative care and community programmes to increase knowledge of risk and protective factors.

Author affiliations

1Institute for Health Metrics and Evaluation, University of Washington, Seattle, Washington, USA
2Institute for Health Metrics and Evaluation, Seattle, WA, for editing this paper.
3Care Sciences and Society (NVS), Karolinska Institute, Stockholm, Sweden
4Clinical and Epidemiology, Cabrini Institute, Melbourne, Victoria, Australia
5Home and Community, Donna’s House, Melbourne, Victoria, Australia
6Rural Health, Mohamed Bin Zayed University of Health Sciences, Abu Dhabi, United Arab Emirates
7National University Hospital, Singapore, Singapore
8Faculty of Medicine, University of Medicine and Health Sciences, Jordan University, Amman, Jordan
9Allopathic and Ayurvedic Medicine, Nepal Medical College, Kathmandu, Nepal
10School of Public Health, University of Minnesota, Minneapolis, Minnesota, USA
11Department of Preventive Medicine, School of Medicine, Kyung Hee University, Seoul, South Korea
12Faculty of Health and Life Sciences, Northumbria University, Newcastle upon Tyne, UK
13Alzheimer Scotland Dementia Research Centre, University of Edinburgh, Edinburgh, UK
14Department of Epidemiology & Population Health, Faculty of Health Sciences, University of Aberdeen, Aberdeen, UK
15Federal University of Santa Catarina, Florianopolis, Brazil
16University of Alabama at Birmingham, and Birmingham Veterans Affairs Medical Center, Birmingham, Alabama, USA
17Alcohol and Drug Research Western Norway, Stavanger University Hospital, Stavanger, Norway
18Department of Anesthesiology, University of Virginia, Charlottesville, Virginia, USA
19Outcomes Research Consortium, Cleveland Clinic, Cleveland, Ohio, USA
20Department of Anesthesiology, King Fahad Medical City, Riyadh, Saudi Arabia
21Department of Internal Medicine, Federal Teaching Hospital, Abakaliki, Nigeria
22Federal Institute for Population Research, Wiesbaden, Germany
23German National Cohort Consortium, Heidelberg, Germany
24Department of Biostatistics, School of Public Health, Kyoto University, Kyoto, Japan
25Department of Preventive Medicine, College of Medicine, Korea University, Seoul, South Korea
26Jackson State University, Jackson, Mississippi, USA
27University Hospital, Setif, Algeria
28Melbourne School of Population and Global Health, University of Melbourne, Melbourne, Victoria, Australia

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Contributors

MM-L and AHM prepared the first draft. All other authors provided data, developed models, analyzed data, reviewed results, provided guidance on methodology and/or reviewed the manuscript. MM-L and AHM finalized the draft based on comments from other authors’ feedback. MM-L, AHM, AA and MHF responded the comments of reviewers. AHM and CILM accept full responsibility for the work, have access to the data and controlled the decision to publish.

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Competing interests

None declared.

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