Original Article

A patient caregiver survey in Indonesia: Knowledge and perception of antibiotic use and microbial resistance

Fauna Herawati a,b,* Setiasih c, Muznah M. Alhabsy a, Willyam Gunawan a, Debra E. Palijama a, Lusiana F. Diaha, Nabila A. Adriansyah a, Rika Yulia a, Christina Avanti d

A Department of Clinical and Community Pharmacy, Faculty of Pharmacy, University of Surabaya, Jalan Raya Kalirungkut, Surabaya, 60293, Indonesia
b Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmacy, Universitas Indonesia, Depok, 16424, Indonesia
c Department of Psychology, Laboratory for Developmental Psychology, Faculty of Psychology, University of Surabaya, Jalan Raya Kalirungkut, Surabaya, 60293, Indonesia
d Department of Pharmaceutics, Faculty of Pharmacy, University of Surabaya, Jalan Raya Kalirungkut, Surabaya, 60293, Indonesia

A R T I C L E   I N F O

Article history:
Received 10 January 2019
Received in revised form 9 April 2019
Accepted 9 May 2019

Keywords:
Caregiver
Knowledge
Perception
Belief
Antibiotic

A B S T R A C T

Background: A successful antibiotic stewardship program depends not only the knowledge and perceptions of healthcare providers but also patients and caregivers. Accordingly, the caregiver will decide to give the medication for their children. This survey was conducted to observe the caregivers’ knowledge and perceptions of antibiotic use and antibiotic resistance; and their relationship.

Methods: We developed 14 item questions in a knowledge questionnaire and 30 item questions in a perception questionnaire. The knowledge questionnaire was measured by a Guttman scale, with ‘Yes’ or ‘No’ answers, while the perception questionnaire used a five-point Likert scale.

Results: The knowledge about antibiotic resistance is low, while the knowledge about antibiotic administration was the highest score. Caregivers’ perceptions and beliefs about antibiotic use and antibiotic resistance were mostly in the neutral category. The association between knowledge and perceptions about antibiotic use and antibiotic resistance in this study was weak.

Conclusions: The caregivers’ knowledge about antibiotic use was identified to be sufficient, particularly, the antibiotic definition (highest score). The caregivers’ belief about antibiotic use and microbial resistance was neutral (3.5–3.7).

© 2019 The Authors. Published by Elsevier Limited on behalf of King Saud Bin Abdulaziz University for Health Sciences. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Introduction

Antibiotic Stewardship, a specific management program to manage antibiotic resistance, is an effort involving an entire health service organization which focuses on optimizing the use of antibiotics. This program is meant to provide an effective treatment to the patients, to improve any negative consequences such as toxicity, resistance, and to save money [1]. In Indonesia, Antibiotic Stewardship Programs in hospitals are called Program Pengendalian Resisten Antimikroba (PPRA) [2]. Each hospital has to have a PPRA. The PPRA are responsible for managing the development of resistant microbes through minimizing antibiotic selection pressure toward microbe survival by using antibiotics appropriately.

Therefore, PPRA monitors, evaluates and works to increase the compliance to the antibiotic use guidelines by publishing management operating procedures and protocols [2]. In addition to that, a better patient understanding, and awareness will encourage a prudent antibiotic indication and administration. They have to know about not only antibiotic indication, but also the microbial resistance process and how it spreads. The handwashing practices should be routinely demonstrated and hopefully would become a healthy habit [3]. The patients’ and caregivers’ knowledge is an important factor [4–8] and essential to correct belief and behavior in their responsible antibiotic use [6,7]. When they have proper knowledge, they will have a strong belief and appropriate attitudes towards the treatment, self-health attention and good health management in dealing with illness and treatment [9–11]. A survey in Sweden showed that there is a lack of knowledge about antibiotics among people in many communities around the world. Generally, many

* Corresponding author at: Faculty of Pharmacy, University of Surabaya, Jalan Raya Kalirungkut, FF Building, 5th Floor, Surabaya, 60293, Indonesia.
E-mail address: fauna@staff.ubaya.ac.id (F. Herawati).

https://doi.org/10.1016/j.jiph.2019.05.006
1876-0341/© 2019 The Authors. Published by Elsevier Limited on behalf of King Saud Bin Abdulaziz University for Health Sciences. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
people were unsure whether antibiotics were indicated for bacterial and/or viral infection [12].

Based on research done with Americans about perceptions and knowledge, from 215 respondents, most of them agreed that the improper use of antibiotics could cause antibiotic resistance (92%). However, more than 70% responded neutrally or did not agree with the statement that antibiotic resistance was a problem. The conclusion of the research indicated that the participants are aware that antibiotic abuse could cause antibiotic resistance. Nevertheless, most people had the correct perception but incorrectly assumed that this issue was not an important matter [13].

This research was aimed to measure the parent’s knowledge and beliefs about antibiotic use; and therefore, to what extent parents need to know about the wise use of antibiotics in their children. The use of antibiotics in children depends upon their parents, who become the decision makers in the medical treatment of their children. Based on the Narrative Review of Pediatric Decision Making, out of 55 articles, 52 different descriptive qualitative studies indicated that the decision making in children’s medical treatment, namely by parents were also influenced by factors such as the health condition of their children, the knowledge of the parents, and personal reasons like emotions and beliefs [14,15]. In children, the knowledge and perceptions of the parents were measured as the indicators of the achievement of the proper use of antibiotics. This study was implemented with hospital outpatients and not inpatients, because in hospital settings the parents’ participation in medical treatment can be influenced more by nurses and other care providers [16].

**Methods**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the respective hospital managements and was conducted in accordance with the Indonesian Law for the Protection of Personal Data. The study was ethically cleared by the Health Research Ethics Committee of Politeknik Kesehatan Kemenkes Surabaya, Kementerian Kesehatan No. 025/S/KEPK/V/2017. This research was conducted at five hospitals in East Java, i.e. one public hospital in Sidoarjo regency, one public hospital in Gresik regency, and one public hospital in Bangil district, and two private hospitals in Surabaya city (Table 1). These hospitals are representative of the various types of hospitals in Indonesia [17].

**Table 1**

<table>
<thead>
<tr>
<th>Hospital demography.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristics</strong></td>
</tr>
<tr>
<td>Hospital classification</td>
</tr>
<tr>
<td>Levels of care</td>
</tr>
<tr>
<td>Number of beds</td>
</tr>
<tr>
<td>Area geographical ownership</td>
</tr>
</tbody>
</table>


**Table 2**

<table>
<thead>
<tr>
<th>Respondents’ demography.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristics</strong></td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>&lt;20</td>
</tr>
<tr>
<td>&gt;20-25</td>
</tr>
<tr>
<td>&gt;25-30</td>
</tr>
<tr>
<td>&gt;30-35</td>
</tr>
<tr>
<td>&gt;35-40</td>
</tr>
<tr>
<td>&gt;40-45</td>
</tr>
<tr>
<td>&gt;45-50</td>
</tr>
<tr>
<td>&gt;50-55</td>
</tr>
<tr>
<td>&gt;55-60</td>
</tr>
<tr>
<td>&gt;60</td>
</tr>
<tr>
<td>Not available</td>
</tr>
</tbody>
</table>

| Sex                      |       |       |       |       |       |
| Male                     | 12(12.5)| 21(21.9)| 37(38.5)| 19(19.8)| 31(32.3) |
| Female                   | 84(87.5)| 75(78.1)| 59(61.5)| 77(80.2)| 65(67.7) |

| Education                |       |       |       |       |       |
| Primary school           | 8(8.3) | 6(6.3) | 33(34.4)| 0(0)  | 0(0)   |
| Middle school            | 13(13.5)| 24(25) | 25(26) | 1(1)  | 0(0)   |
| High school              | 45(46.9)| 42(43.8)| 28(29.2)| 26(27.1)| 36(37.5) |
| University               | 30(31.3)| 22(22.9)| 10(10.4)| 68(70.8)| 60(62.5) |
| Not available            | 0(0)  | 2(2.1) | 0(0)  | 1(1)  | 0(0)   |

| Monthly income           |       |       |       |       |       |
| Less than IDR1,000,000   | 44(45.8)| 5(5.2) | 57(59.4)| 1(1)  | 0(0)   |
| IDR1,000,000–3,000,000   | 13(13.5)| 28(29.2)| 29(30.2)| 11(11.5)| 1(1)   |
| IDR3,000,001–5,000,000   | 31(32.3)| 9(9.4) | 10(10.4)| 36(37.5)| 34(35.4) |
| IDR5,000,001–10,000,000  | 8(8.3) | 1(1)  | 0(0)  | 27(28.1)| 42(43.8) |
| More than IDR10,000,000  | 0(0)  | 0(0)  | 0(0)  | 17(17.7)| 19(19.79)|
| Not available            | 0(0)  | 53(55.2)| 0(0)  | 4(4.2) | 0(0)   |
about antibiotic use and antibiotic resistance (1 for strongly disagree and 5 for strongly agree). There were four domains in the knowledge questionnaire, i.e.: knowledge about antibiotic definition (1 question), antibiotic resistance (2 questions), healthcare role (1 question); and antibiotic administration (10 questions) (Table 3). The percentage of correct answers for every item was depicted descriptively. There were thirty questions in the patient belief questionnaire, i.e. 8 questions on perceived benefits, 6 questions on perceived barriers, 8 questions on perceived threats, and 8 questions on self-efficacy (Appendix 1).

Participants

The participants of this study were the parents of the outpatient children who were prescribed and administered antibiotics (Table 2). The inclusion criteria for sample selection were: the parents of the outpatient children who got antibiotics prescriptions from the physician, the age of the children was 1 month to 15 years old, and the participants could communicate and had good reading and writing ability. The exclusion criteria were: the parents of children treated as inpatients <1 month or >15 years old, and who could not complete the surveys.

Results

There were 480 questionnaires distributed but only 329 participants completed the surveys. One hundred and fifty-one questionnaire demographic data were incomplete, and mostly were questions related with income (salary). From 329 participants who completed the questionnaire, 69.0% of participants were female. The age of the respondents ranged 25–45 years old in Hospital A, B, and C; whereas it was between 25–40 years old in Hospital D and E. More than 70% reached primary – high school and more than 50% of respondents have monthly income < IDR 3.000.000 in the government hospitals (Hospital A, B, C); while almost all finished high school and university and more than 50% of respondents have monthly income > IDR 3.000.000 in private hospitals (Hospital D, E). More than 50% of respondents in one hospital did not answer the question about monthly income (Table 2).

The participants had strong knowledge scores on antibiotic administration and antibiotic definition (high: 87.5% and 94.8%, respectively), average on healthcare role (high: 68.4%), and weak conceptions of knowledge about antibiotic resistance (high: 25.2%) (Table 2). Questions with correct answers less than 60% were (i) ‘The selection of antibiotics is not always performed by doctors or pharmacists’ in Hospital C (Bangli district), (ii) ‘The dosage of antibiotics can be reduced by him/her self if the body condition feels better’ in Hospital C, (iii) ‘Buying or discontinuing the use of antibiotics without any notification from doctors/pharmacists does not result in bacterial resistance to antibiotics’ in Hospital B (Gresik regency), (iv) ‘Antimicrobial resistance to antibiotics can be prevented by stop antibiotics as soon as possible if you feel healed’ in Hospital A-B-C, and (vi) ‘Antibiotic resistance is a con-
dition in which antibiotics are successful in combating bacteria’ in all hospitals (Table 3).

Individual beliefs consist of four domains, i.e. threats felt or perceived threats, benefits felt or perceived benefits, barriers felt or perceived barriers and beliefs towards what they can do or perceived self-efficacy. The perceived self-efficacy had the highest score; the perceived benefits and barriers had the lowest score. The overall respondents’ belief score was 3.5–3.6 (Table 4, Appendix 1).

Discussion

This study shows that the caregivers’ knowledge about antibiotic was sufficient. Ninety-six percent and ninety-two percent of participants respectively answered the questions about antibiotic definition and administration correctly. This information was usually given by pharmacists whenever the patient took their medication at a pharmacy [18]. The results of the knowledge of the participants were also related to previous personal experience and the quality of the information provided [19]. Patients with good knowledge were more likely to have good antibiotic practices [20].

The lowest score for correct answers was the question about antibiotic resistance. Only thirty-three percent of respondents answered it correctly. The lack of respondents’ knowledge about antibiotic resistance in this study was similar with research by Andre et al. in the US, which indicated that people, in general, were still confused about antibiotic resistance and believed that people, not bacteria, would become resistant to antibiotics [21]. This study showed that respondents from the private hospitals more likely answered correctly the question, ‘antibiotic resistance is a condition in which antibiotics are successful in combating bacteria’ than respondents from the public hospitals. The number of respondents with a university degree at private hospitals was almost three times higher than the number of respondents with a university degree at public hospitals. This finding supported the findings from the Davis study, where ninety-three percent of patients with college level education correctly believed that antibiotics work for treating infections from bacteria whereas only eighty percent of patients without college level education believed it [22].

In this study, the knowledge result agrees with the perceived benefit score (3.4), indicating the respondents believe antibiotics are effective and prevent any disease from getting worse. The results concurred with Hamm et al.'s study, sixty-five percent of patients expected antibiotics to treat their sinuses or bronchitis and even when diagnosed with viral infections [23]. Hansen et al.'s study in 2015 showed that parents in Brisbane, Australia assumed that antibiotics were the best treatment for acute otitis media in children [24]. In 2017, a systematic review summary stated that parents are not disappointed for not prescribing antibiotics if the physician provided a proper explanation and an alternative plan (in case the symptom were getting worse) [10]. Some respondents believed that antibiotics are a medicine to prevent diseases and not a medicine to cure diseases; [21,25] or antibiotics cure common colds more quickly [26].

In this study, more than 50% of parents of the children patients in the hospitals feel a barrier to follow the antibiotic administration instruction, i.e. ‘difficult to take antibiotics every 8 h a day’. This result was similar to studies by Ingerski [27] and Modi [28] that found the barriers to treatment adherence involved difficulties with time management. This situation would threaten antibiotic effectiveness, particularly for a time-dependent antibiotic.

Conclusion

Knowledge of the caregivers of children patients in the hospitals in the antibiotic administration and definition was identified to be sufficient for getting benefits from antibiotics and having to administer them regularly. The belief of the caregivers in the hospitals in antibiotic use was neutral. The knowledge about antibiotic resistance and their perceived barrier score were low. Considering their essential role, caregivers are one of the important targets of the educational strategy in successful antibiotic stewardship programs [26]. Continued public awareness campaigns and education are necessary to increase their knowledge, to strengthen their beliefs and to improve their health behavior.

Funding

This study was supported with a research grant No. 29/SP-Lit/LPPM-01/Dikti/FF/V/2017 from Ministry of Research, Technology and Higher Education of the Republic of Indonesia (Menteri Riset, Teknologi dan Pendidikan Tinggi, Menristekdikti).

Conflict of interest

The authors declare that they have no conflict of interest.

Key points

The appropriateness of children medications depends on the caregivers’ knowledge and perceptions. This study shows that the caregivers’ knowledge and perceptions are low, therefore continued public awareness campaigns and education are necessary to increase their knowledge, to strengthen their beliefs and to improve their health behavior.

Acknowledgements

We are grateful to the management and staff of hospitals for allowing us to collect the data and to use them for the evaluation. We would like to thank the staff at Klinik Bahasa, Faculty Redokteran, Universitas Gadjah Mada (Yogyakarta) for helping to edit the manuscript.

APPENDIX 1 Questionnaire on patient’s belief

<table>
<thead>
<tr>
<th>No</th>
<th>Statements</th>
<th>Strongly disagree → strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Despite the bitter taste of antibiotics, my child has to take them because I know my child can recover</td>
<td>1 – 2 – 3 – 4 – 5</td>
</tr>
<tr>
<td>2</td>
<td>If my child’s bacteria is susceptible to antibiotics, I can use cheaper drugs for my child</td>
<td>1 – 2 – 3 – 4 – 5</td>
</tr>
<tr>
<td>3</td>
<td>If my child completes the course of antibiotic, I can reduce the risk of antibiotic resistance</td>
<td>1 – 2 – 3 – 4 – 5</td>
</tr>
</tbody>
</table>
If my child takes antibiotics until finished, my child can recover
5 For antibiotic need to take antibiotics so that I can quickly recover
6 Antibiotics have few side effects
7 I choose antibiotics because they are safe to use
8 Antibiotics are used to prevent my child’s illness from getting worse

Perceived barrier
9 If the prescription stated to take antibiotics every 8 h a day, it makes me feel difficulty to arrange drug schedule for my child
10 My child has difficulty taking antibiotics because of the bitter taste
11 The relatively large size of antibiotic tablets makes my child face difficulty to take them
12 Taking 3x one day’s antibiotic for my child can be given in the morning at 06.00, noon at 14.00 and in the afternoon at 18:00
13 My child is not allowed to drink milk when he/she take antibiotics
14 My child wants to take antibiotics, if they are syrup

Perceived threat
15 Antibiotics not in accordance with the doctor’s recommended dosage will worsen my child’s illness
16 Antibiotic treatment without a doctor’s prescription leads to bacterial in my child’s body resistance to antibiotics
17 Using antibiotics not in accordance with the prescription leads to longer treatment duration
18 Taking antibiotics irregularly can cause fatal side effects such as death
19 Taking antibiotics without a doctor’s prescription leads to difficulty in treating my child’s illness
20 The use of antibiotics not in accordance with the doctor’s prescribed course will worsen my child’s health condition
21 Not taking all antibiotics prescribed by the doctors may aggravate the disease
22 The use of antibiotics without a prescription leads to my child’s kidney damaged

Perceived self-efficacy
23 I always try to make my child take antibiotics as prescribed by the doctor
24 I am not sure my child will recover even though she/he finish the antibiotics as prescribed by the doctor
25 I am sure my child is recovering quickly because of taking antibiotics
26 I need to find additional information about the antibiotics my doctor prescribes for my child
27 I clarified to the doctor / pharmacist about the antibiotics given to my child
28 I’m not sure my child needs to take all the antibiotics prescribed by the doctor
29 Finishing antibiotics is easy for my child
30 I always try not to buy antibiotics without a doctor’s prescription

References

SCOPE

The Journal of Infection and Public Health, first official journal of the Saudi Arabian Ministry of National Guard Health Affairs, King University for Health Sciences and the Saudi Association for Public Health, aims to be the foremost scientific, peer-reviewed journal in infection prevention and control, microbiology, infectious diseases, public health and the application of healthcare epidemiology to health outcomes. The point of view of the journal is that infection and public health are closely intertwined and that advances in one positive consequences on the other. The journal will be useful to all health professionals who are partners in the management of communicable diseases, keeping them up to date. The journal is proud to have an international and diverse editorial board that will facilitate the publication of articles that reflect a global view on infection control and public health, as well as emphasizing our focus on the needs of public health practitioners. It is our aim to improve healthcare by reducing risk of infection and related adverse outcomes in healthcare settings and the community.

Join the conversation about this journal

Research Methods

Dedicated to Preventing & Countering Violent Extremism.

The Science of P/CVE

FIND SIMILAR JOURNALS
Evaluation

Evidence-based, actionable research & evaluation.

The Science of PICVE

1. Journal of Infection in Developing Countries
   ITA
   86% similarity

2. Canadian Journal of Infectious Diseases and EGY
   81% similarity

3. International Journal of Infectious Diseases
   NLD
   80% similarity

4. BMC Infectio
   GBR
   7% similarity

- SJR: The SJR is a size-independent prestige indicator that ranks journals by their 'average prestige per article'. It is based on the idea that 'all citations are not created equal'. SJR is a measure of scientific influence of journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from. It measures the scientific influence of the average article in a journal and expresses how central to the global scientific landscape a journal is.

- Total Documents: Evolution of the number of published documents. All types of documents are considered, including citable and non-citable documents.

- Citations per document: This indicator counts the number of citations received by documents from a journal and divides them by the total number of documents published in that journal. The chart shows the evolution of the average number of times documents published in a journal in the past two, three and four years have been cited in the current year. The two years line is equivalent to journal impact factor™ (Thomson Reuters) metric.

- Cites per document: Evolution of the number of total citation per document and external citation per document (i.e. journal self-citations removed) received by a journal's published documents during the three previous years. External citations are calculated by subtracting the number of self-citations from the total number of citations received by the journal's documents.

- Total Cites: Evolution of the total number of citations and journal's self-citations received by a journal's published documents during the three previous years. Journal self-citation is defined as the number of citation from a journal citing article to articles published by the same journal.

- External Cites per Doc: Evolution of the number of total citation per document and external citation per document (i.e. journal self-citations removed) received by a journal's published documents during the three previous years.

- % International Collaboration: International Collaboration accounts for the articles that have been produced by researchers from several countries. The chart shows the ratio of a journal's citable documents and non-citable documents.

- % International Collaboration: International Collaboration accounts for the articles that have been produced by researchers from several countries. The chart shows the ratio of a journal's citable documents and non-citable documents.
Mr. Michael Holbach 2 years ago

Dear Sir or Madame,

did You get the following message ? It has been sent at May 6 th 2019 (12:22 h) to ’jiph@elsevier.com’; titel: ”study attached, ”Vitamin D and ARI”, worth to submit?”

Of course I’d love to send the attachment again, if wanted ?

Thank You very much and kind greetings
Michael Holbach
(address see below)
Dear Sir or Madame,

we hereby kindly ask if You could have a look at the attached work with the question of whether it might be of interest that we submit it for publication in the “Journal of Infection and Public Health”.

We are uncertain about this, e.g. because it is a study that could not be designed in advance and not done prospectively. Also it includes a relatively small collective. (see methodological limitations under discussion). – However, it could be a small contribution to an important and currently quite up to date public health issue (with an approach, different to existing studies about that subject).

For Your efforts and advise we thank You very much in advance.

Best regards
Michael Holbach

PS: the text has not yet been supervised linguistically, so we apologize for errors in the English language at the present stand.

******************************************************************************

Dr. Michael Holbach, M.P.H.
Abtg Arbeitsmedizin des Bez. Unterfranken
Am Sommerberg 15
D-97816 Lohr (Germany)
 Ruf: 09352-503-30911
 E-Mail: michael.holbach@bezirkskrankenhaus-lohr.de

reply
The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.
**Source details**

**Journal of Infection and Public Health**

*Open Access*  
Scopus coverage years: from 2008 to Present  
Publisher: Elsevier  
ISSN: 1876-0341  
E-ISSN: 1876-035X

**Subject area:**  
- Medicine: Public Health, Environmental and Occupational Health  
- Medicine: Infectious Diseases

**Source type:** Journal

**CiteScore 2020**  
4.9  
Calculated on May, 2021

**SJR 2020**  
0.983

**SNIP 2020**  
1.948

---

**CiteScore rank & trend**

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>#84/526</td>
<td>84th</td>
</tr>
<tr>
<td>Medicine</td>
<td>#91/288</td>
<td>68th</td>
</tr>
</tbody>
</table>

---

**Scopus content coverage**

**Improved CiteScore methodology**  
CiteScore 2020 counts the citations received in 2017-2020 to articles, reviews, conference papers, book chapters and data papers published in 2017-2020, and divides this by the number of publications published in 2017-2020. [Learn more >](https://www.scopus.com/sourcefinder/servlets/sourcefinder)
About the journal

Editor-in-Chief

Sameera Al Johani
King Abdulaziz Medical City Department of Infection Prevention and Control,
Riyadh, Saudi Arabia

Associate Editors

Awa Aidara-Kane
World Health Organization Department of Food Safety and Zoonoses, Genève,
Switzerland

Jaffar Al Tawfiq
John Hopkins Aramco Healthcare, Dhahran, Saudi Arabia

Benedetta Allegranzi
World Health Organization, Geneva, Switzerland

Majid M. Alshamrani
King Abdulaziz Medical City Department of Infection Prevention and Control,
Riyadh, Saudi Arabia

Matteo Bassetti
University Hospital Santa Maria della Misericordia of Udine, Udine, Italy

Peter Horby
University of Oxford Centre for Tropical Medicine and Global Health, Oxford,
United Kingdom

Georgio Pappas
University General Hospital of Ioannina, Ioannina, Greece

Paul Anantharajah Tambyah
National University Singapore Yong Loo Lin School of Medicine, Singapore,
Singapore

Executive Advisory Editor

Hanan Balkhy
King Abdulaziz Medical City Department of Infection Prevention and Control,
Riyadh, Saudi Arabia
Managing Editor

Shuaib Hussain Valyanna
King Abdulaziz Medical City Department of Infection Prevention and Control,
Riyadh, Saudi Arabia

Executive Editorial Advisory Board

Louise Marie Dembry
VA Connecticut Healthcare System - West Haven Campus, West Haven, United
States of America

Keiji Fukuda
University of Hong Kong School of Public Health, Pokfulam, Hong Kong

Rana Hajjeh
World Health Organisation Regional Office for the Eastern Mediterranean, Cairo,
Egypt

Hani Jokhdar
Ministry of Health Infection Control Directorate, Riyadh, Saudi Arabia

Rima Khabbaz
Centers for Disease Control and Prevention Office of Infectious Diseases, Atlanta,
United States of America

Dick Menzies
McGill University Respiratory Division, Montréal, Canada

Didier Pittet
UH Geneva Medical Center, Geneva, United States of America

Robert Steffen
University of Zurich Travel Clinic, Zürich, Switzerland

Maria Van Kerkhove
Pasteur Institute Center for Global Health, Paris, France

Timothy R. Walsh
Cardiff University Cardiff Institute of Infection and Immunity, Cardiff, United
Kingdom

David Weber
University of North Carolina at Chapel Hill Gillings School of Global Public
Health, Chapel Hill, United States of America
Editorial Board

N. Abdul Razzaq
Ministry of Health - Dubai, Dubai, United Arab Emirates

M. Akova
Hacettepe University Department of Infectious Diseases and Clinical Microbiology, Ankara, Turkey

H. Al Abdaly
Ministry of Health Infection Control Directorate, Riyadh, Saudi Arabia

S. Al Abri
The Royal Hospital Department of Infectious Diseases, Muscat, Oman

A. Al Assiri
Ministry of Health Infection Control Directorate, Riyadh, Saudi Arabia

A. Al Barrak
Prince Sultan Military Medical City, Riyadh, Saudi Arabia

H. Al Katheri
Qatar Ministry of Public Health Healthcare Quality Management and Patient Safety Department, Doha, Qatar

S. Al Khawaja
Salmaniya Medical Complex, Al Manamah, Bahrain

A. Al Othman
King Abdulaziz Medical City, Riyadh, Saudi Arabia

J.M. Al Salman
Salmaniya Medical Complex Department of Internal Medicine, Al Manamah, Bahrain

A. Al Thaqafi
King Saud bin Abdulaziz University for Health Sciences College of Public Health and Medical Informatics, Riyadh, Saudi Arabia

S. Al Thawadi
King Faisal Specialist Hospital and Research Centre Department of Pathology and Laboratory Medicine, Riyadh, Saudi Arabia

M. Al Zahrani
Security Forces Hospital Program, Riyadh, Saudi Arabia
A. Alrajhi  
King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

Y.M. Arabi  
King Saud bin Abdulaziz University for Health Sciences College of Medicine, Riyadh, Saudi Arabia

A. El Metwally  
King Saud bin Abdulaziz University for Health Sciences College of Public Health and Medical Informatics, Riyadh, Saudi Arabia

R. El-Sokkary  
Zagazig University, Zagazig, Egypt

M. E. Falagas  
Alfa Institute of Biomedical Science, Athens, Greece

S. Gordon  
Emory University Department of Medicine, Atlanta, United States of America

J Jagger  
University of Virginia School of Medicine, Charlottesville, United States of America

W. Jarvis  
Jason and Jarvis Associates, South Carolina, United States of America

S. Mehtar  
Fac. of Medicine and Health Sciences, Beheer Unit for Infection Prevention and Control, Stellenbosch University and Tygerberg Academic Hospital, Stellenbosch, South Africa

M. Muneeef  
King Abdulaziz Medical City Department of Pediatrics, Riyadh, Saudi Arabia

T. Perl  
Johns Hopkins University Division of Infectious Diseases, Baltimore, United States of America

M. C. Ramírez-Soto  
Cayetano Heredia Pervuvian University School of Public Health and Management Carlos Vidal Layseca, Lima, Peru
V Rosenthal
International Nosocomial Infection Control Consortium, Buenos Aires, Argentina

B Soule
UNIVERSITY OF WASHINGTON SCHOOL OF MEDICINE, Seattle, United States of America

Honorary Editorial Board

Bandar Al Knawy
King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

Abdullah Al Rabeah
Ministry of Health - Dubai, Dubai, United Arab Emirates

Ex-officio (Past) Editor-in-Chief

Memish
Alfaisal University College of Medicine, Riyadh, Saudi Arabia

Editorial Assistant

Brittany Lucas
King Abdullah Medical City Department of Infection Prevention and Control, Riyadh, Saudi Arabia

Biostatistics Editor

Aiman El Saed
King Saud bin Abdulaziz University for Health Sciences College of Public Health and Medical Informatics, Riyadh, Saudi Arabia

All members of the Editorial Board have identified their affiliated institutions or organizations, along with the corresponding country or geographic region. Elsevier remains neutral with regard to any jurisdictional claims.

ISSN: 1876-9341

Copyright © 2021 Saudi Arabian National Guard Health Affairs - King Abdullah Medical City. All rights reserved
Novel Coronavirus (COVID-19) Papers

Review Articles

- COVID-19 infection prevalence in pediatric population: Etiology, clinical presentation, and outcome
  Fahad Alshehri, Mohamad-Harii Tensah, Abdulrahman M. Al-Nemri, Ali M. Somily, Sarah Al-Sabale
  Pages 1791-1796
  [Download PDF] [Article preview]

- Comparative epidemiology between the 2009 H1N1 influenza and COVID-19 pandemics
  Viválio Gomes da Costa, Marilenea Vogel Senišš, Dhulya Eduarda Resende Santos, Rebeca Francielle de Lima Silva, Marcos Lázaro Morello
  Pages 1797-1804
  [Download PDF] [Article preview]

- Precautions in dentistry against the outbreak of corona virus disease 2019
  Guangwen Li, Sai Chang, Hai Li, Rui Wang, Gang Li
  Pages 1805-1810
  [Download PDF] [Article preview]

- Opinions on the current pandemic of COVID-19: Use functional food to boost our immune functions
  Bo Han, Bo X. Hoang
  Pages 1811-1817
  [Download PDF] [Article preview]

- Positive aspects, negative aspects and limitations of plasma therapy with special reference to COVID-19
  Harshvardhan Nagrane, Ajay Gokhale, Nasir Jamadar, Sachin Mumbra, Sohan Salikar
  Pages 1818-1822
  [Download PDF] [Article preview]

- Malaysia's approach in handling COVID-19 onslaught: Report on the Movement Control Order (MCO) and targeted screening to reduce community infection rate and impact on public health and economy
  Noor Adzah Aziz, Jamal Othman, Hafiza Lugova, Adina Sulaiman
  Pages 1823-1829
  [Download PDF] [Article preview]
Syndrome resembling Kawasaki disease in COVID-19 asymptomatic children
Surya Rahman, Tariq Majed, Mohammad Azam Ansari, Ebtessam A. Al-Suhaimi
Pages 1830-1832

COVID-19 and comorbidities: Deleterious impact on infected patients
Hasan Ejaz, Abdullah Alshihabi, Aizza Zafar, Humera Javed, ... Sonia Younas
Pages 1833-1839

Coronaviruses disease 2019 (COVID-19): Causative agent, mental health concerns, and potential management options
Sulman Khan, Rabia Siddique, Qian Bai, Shabana, ... Jianbo Liu
Pages 1840-1844

Adoption of telemedicine applications among Saudi citizens during COVID-19 pandemic: An alternative health delivery system
Mohammad Ali Yousef Yamin, Bader A. Alyoubi
Pages 1845-1855

Raltegravir, Indinavir, Tipranavir, Dolutegravir, and Etravirine against main protease and RNA-dependent RNA polymerase of SARS-CoV-2: A molecular docking and drug repurposing approach
Purusothaman Indu, Marimuthu Ragavaran Kameshkumar, Narasingam Arunagirinathan, Naif Abdullah Al-Dhabi, ... Savarimuthu Ignanimuthu
Pages 1856-1861

Effect of a strict hygiene bundle for the prevention of nosocomial transmission of SARS-CoV-2 in the hospital: a practical approach from the field
Andreas Ambrosio, Felix Rockmann, Frank Klawonn, Benedikt Lampi
Pages 1862-1867
Research article

Computational studies reveal mechanism by which quinone derivatives can inhibit SARS-CoV-2. Study of embelin and two therapeutic compounds of interest, methyl prednisolone and dexamethasone
Francesco Caruso, Miriam Ross, Jens Z. Pedersen, Sandra Incerti
Pages 1868-1877

Case Report

Case report of a neonate with high viral SARS-CoV-2 loads and long-term virus shedding
Monique M.J. Slaats, Maud Versteyleen, Karin E. Gast, Bas B. Oude Munnink, ... Ron van Beek
Pages 1878-1884

Letters to the Editor

Correspondence

In-silico primer designing and PCR for detection of novel coronavirus-19
Shashi Kant Tiwari, Ajay Kumar Singh, Arinash Singh
Pages 1885-1886

Correspondence

Hypocalcemia and hypoalbuminemia during COVID-19 infection: Opportunities for therapeutic intervention
Vijay P. Singh, Birewjit Khatua, Bana El-Kurdi
Page 1887

Regular Papers

Review Article

Prosthetic joint infection. A relevant public health issue
Enrico Maria Zardi, Francesco Franceschi
Pages 1888-1891
Effects of disinfectants and ciprofloxacin on quorum sensing genes and biofilm of clinical Pseudomonas aeruginosa isolates
Nilufar Uzunbayir-Akcal, Yamaç Tekintas, Fethiye Farda Yılmaz, İsmail Öztürk, ... Mine Hesgor-Limonou
Pages 1932-1938
Download PDF Article preview

Trajectories of symptoms and healthcare use following respiratory tract infections in rural Anhui, China: a cross-sectional study
Yue Wu, Shiyu Xu, Xingrong Shen, Jing Cheng, ... Debin Wang
Pages 1939-1945
Download PDF Article preview

Time and personnel requirements for antimicrobial stewardship in small hospitals in a rural area in Germany
Irit Nachigall, Sascha Tafelski, Edwin Heucke, Oliver Witzke, ... Marzia Bonsignore
Pages 1946-1950
Download PDF Article preview

Antimicrobial activity of novel 5-benzylidene-3-(3-phenylallylideneamino)imidazolidine-2,4-dione derivatives causing clinical pathogens: Synthesis and molecular docking studies
Dasud Ali, Saud Alanif, Sathish Kumar Chidambaram, Surendra Kumar Radhakrishnan, Idhayadhulla Akbar
Pages 1951-1960
Download PDF Article preview

The Correlation between the Determination of Vaginal Micro-Ecological Composition and the Outcome of HPV Infection by High-Throughput Metagene Sequencing Information Technology on the Illumina Platform
Weiye Cheng, Fei Xu, Lilei Gao, Jinwei Liu
Pages 1961-1966
Download PDF Article preview

Assessment of current diagnostic algorithm for detection of mixed infection with Mycobacterium tuberculosis and nontuberculous mycobacteria
Qian Liang, Yuanyuan Shang, Fengmin Hou, Yi Xue, ... Yu Pang
Pages 1967-1971
Download PDF Article preview
Epidemiology and burden of invasive fungal infections in the countries of the Arab League
Joumana Kmeid, Jean-François Jabbour, Souha S. Kanj
Pages 2080-2086
Download PDF  Article preview

A patient caregiver survey in Indonesia: Knowledge and perception of antibiotic use and microbial resistance
Fauna Herawati, Setiash, Muznah M. Alhabsy, Willyam Gunawan, ... Christina Avanti
Pages 2087-2091
Download PDF  Article preview

Epidemiology of invasive and non-invasive pneumococcal infections in hospitalised adult patients in a Lebanese medical centre, 2006–2015
Rima Moghrir, Hani Tamim, Lyn Awad, Dana Abdallah, ... Ghassan Dbaibo
Pages 2092-2100
Download PDF  Article preview

Carbapenem resistant organisms: A 9-year surveillance and trends at Saint George University Medical Center
Amanda Chamieh, Gerard El-Hajj, Omar Zmerli, Claude Aff, Eid Azar
Pages 2101-2106
Download PDF  Article preview

Antibiotic susceptibility of H. influenzae with particular emphasis on beta lactamase production versus PBP modification
Hicham Aduls
Page 2107
Download PDF

Analysis of CAST in 10 Lebanese hospitals between 2008 and 2017
Joseph Fares, Elane Jabbour, Asad Haridar, Hassan Souldar, ... Ziad Daoud
Pages 2107-2108
Download PDF
Antibacterial activity of commercialized diet pills on the human intestinal microflora
Majd Haddam, Mohammad Othman, Christelle Chedid, Mirel Janji, ... Roula M. Abdel-Massih
Page 2108
Download PDF

Antibacterial Activity of *Fex paraguariensis* (Yerba Mate): After sub-fractionation with different solvents
Sahar El-Sawi, Caren Bachour, Antoine Abou Fayed, Roula M. Abdel-Massih
Pages 2108-2109
Download PDF

Antiviral effects of soil-bound compound compounds
Malak Kaddoura, Dana Itani, Rania Azar, Antoine Abou Fayed, Hassan Zarak
Page 2109
Download PDF

Assessment of heavy metal and antibiotic resistance of Gram negative bacteria isolated from war-zones
Mouayad M. Bakish, Wael Bazzi, Antoine Abou Fayed, Ghassan M. Matar
Page 2109
Download PDF

“Bacteria dominate weapons, soldiers and civilians”: Elucidating the molecular mechanisms and the impact of heavy metals on antimicrobial resistance in war zones
Wael Bazzi, Aya Nasser, Mouayad M. Bakish, Ghassan S. Abu-Sitta, ... Ghassan M. Matar
Page 2110
Download PDF

Bloodstream infection in hemodialysis patients with end-stage renal disease at Rafic Hariri University Hospital
Abi Hanna Pierre, Harb Mivate, Youssef Bou Rached Charbel
Pages 2110-2111
Download PDF
Carriage of multi drug resistant Gram negative bacilli among the intestinal flora of pets in Lebanon
Anas Obeid, Ahmad Sleiman, Estelle AK, Maria Dib, ... Ziad Daoud
Page 2111

Download PDF

Characterization of molecular mechanisms of heavy metal driven antibiotics resistance in clinical and war zones isolates of Acinetobacter baumannii
Aya Nasser, Waad Bazzi, Antoine Abou Fayad, Ghassan M. Matar
Page 2111

Download PDF

Drosophila melanogaster as a model system to assess the effect of EBV DNA on inflammatory gut diseases
Jocile Mody, Araini Al Oota, Milma Ghannam, Hadi Hussein, ... Elias Rahal
Pages 2111-2112

Download PDF

EAPBCS03: an imiquimod analog with potent in vitro activity against cutaneous leishmaniasis caused by Leishmania major and Leishmania tropica
Rana El Hajj, Hanady Bou Youness, Laurence Lachaud, Patrick Bastien, ... Ibrahim Khalifeh
Page 2112

Download PDF

Elucidating the efficacy of combination therapy and colistin resistance mechanisms in MDR/XDR Gram-negative Bacilli
Diana Abdulghani, Waad Bazzi, Antoine Abou Fayad, George F. Araji, Ghassan M. Matar
Pages 2113-2113

Download PDF

Evaluation of the combinatorial effect of Ecalta each with Levofloxacin and Amikacin on preformed biofilm of Pseudomonas aeruginosa
Sara G. Issa, Sarh Rachid, Wael Bazzi, Antoine Abou Fayad, Ghassan M. Matar
Page 2113

Download PDF
How many and which of our nurses are ESBL-carriers?
Joanna Abi Ghanem, Mike Al Aenam, Nicholas Haddad
Page 2113
Download PDF

High prevalence of rectal carriage of blaKPC-medicated carbapenem-resistant Enterobacteriaceae among healthy community food handlers and infected inpatients from different hospitals in Kuwait
G. Frounai, Y. Roitini, N. Al-Sheib
Pages 2112-2114
Download PDF

Increased interleukin-17A levels through toll-like receptor 9 and modulated expression of regulatory markers in response to Epstein-Barr virus DNA
Hadi M. Hussein, Noor Salloum, Rana Jammaz, Sara Jabe, ... Elias A. Rahal
Page 2114
Download PDF

Infective endocarditis: a university hospital series
Jimmy Chahine, Pierre Abi Hanna, Luda Khalil
Page 2114
Download PDF

Infectious complications during pre-engraftment after allogeneic hematopoietic stem cell transplantation
Rima Moghnieh, Amin Abd, Lyn Awad, Maws Jadayel, ... Ahmad Ibrahim
Page 2115
Download PDF

Investigating the mechanism of cefazidine-avibactam resistance in addition to the effect of vancomycin on antibacterial resistance in carbapenem-resistant Klebsiella pneumonia
Nour Sherri, Nassra Risik, Antoine Abou Fayed, Houda Harastani, ... Ghassan M. Matar
Pages 2111-2110
Download PDF
Multi-drug resistant Gram negative bacilli in cockroaches collected from hospital and community environments in Lebanon
Ahmad Sleiman, Anas Obeid, Iman Dandashi, Mohamad Wahoud, ... Ziad Daoud
Page 2116
Download PDF

P18 surface antigen mediates reactivation of cerebral toxoplasmosis in murine models displaying an interferon-gamma immune response
Maguy Hamie, Nadim Tawil, Lea Maalcuf, Rana El Hajj, ... Hiba El-Hajj
Pages 2116-2117
Download PDF

Pseudomonas aeruginosa bacteremia in neutropenic cancer patients at a tertiary care center in Lebanon: a retrospective review
Jean-Francois Jabbour, Saeed El-Zein, Souha S. Kanj
Page 2117
Download PDF

Spread of plasmidic AmpC in a general Lebanese hospital over 5 consecutive years and relationship with restricted isolation protocol
Mohamad Heefel, Ham Sidawi, Khalil Masri, Nathalie Rizk, Ziad Daoud
Pages 2117-2118
Download PDF

The antibacterial activity of different extracts from two Lebanese indigenous plants: Stackys chrenbergii and Calamintha origanifolia
Karim A. Bachour, Sabah El-Sawalhi, Marz El Beyrouthy, Roula M. Abdel-Masih
Page 2118
Download PDF

Two cases of peritoneal tuberculosis and high CA 125 marker
P. Finianos, Ch. Lahoud, E. Elias, M. Matar
Page 2119
Download PDF