Research Article

iMedPub Journals
www.imedpub.com

Journal of Preventive Medicine
ISSN 2572-5483

2020
Vol.5 No.4:19

DOI: 10.36648/2572-5483.5.4.19

Population-Based Random Survey for detection of COVID-19 Infection and Seroprevalence in Benghazi- Libya May/2020

Amal A Elfakhri[1]*, Abdelghffar F Abdelghffar[2], Ahmed F Elhassi[3], Rafik R Elmehdawi[3], Fathia S Belkasem[3], Ahmed B Elhaddad[3], Monier S A Mohammed[4], Amina A Ashekteria [1], Fatma I E Najem[5], Aya M F Alfarjany[5]

1 Department of Family and Community Medicine, Faculty of Medicine- University of Benghazi, Libya.
2 The Libyan Centre of Actuarial Studies- Benghazi, Libya.
3 Department of Medicine, Faculty of Medicine- University of Benghazi, Libya.
4 Department of Medical Microbiology, Faculty of Medicine- University of Benghazi, Libya.
5 The Center of Infectious Diseases- Benghazi, Libya.

***Corresponding author:**
Amal A Elfakhri

amal.elfakhri@uob.edu.ly

Citation: Elfakhri AA, Abdelghffar AF, Elhassi AF, Elmehdawi RR, Belkasem FS, et al. (2020) Population-Based Random Survey for detection of COVID-19 Infection and Seroprevalence in Benghazi- Libya May/2020. J Prev Med Vol. 5 Iss No. 4: 19.

Abstract

Background: Covid-19 is a significant health problem worldwide with a fear of being unstoppable. Screening for COVID-19 is of great public health importance as it might provide better understanding of epidemiological status and might benefit decision making.

Aims: To detect hidden COVID-19 cases and to identify immunity status against COVID-19 of Benghazi population.

Methodology: This screening was undertaken on a cross-section of the population between the 2nd and the7th of May 2020. A multistage stratified sample was drawn from randomly selected geographical areas of Benghazi, the sampling units were weighted in respect to population density in each area.

Results: A sample of 600 participant has been screened for COVID-19 current infection or seropositive antibody assay, all of them tested negative. Male constituted 50.5% of the sample, age ranged from 10 to 90 years, 94.9% Libyan. Only 1.1 % has been abroad since January 2020, 0.7% has household contact with an arrival from abroad. COVID-19 like symptoms were almost negligible, they were reported as the following, 0.7% headache, 0.5% for each of fever and breathlessness, cough and sore throat by % 0.3 each and diarrhea by 0.2% of the study sample.

Conclusion: This survey revealed that there are no active undetected cases of the disease; in addition to that COVID-19 infection was not circulating in Benghazi population prior to the study time.

Keywords: COVID-19, Screening, Infection, epidemiological, Benghazi population, seropositive antibody assay, Sero-conversion

Received: August 29, 2020, **Accepted:** September 22, 2020, **Published:** September 29, 2020

Introduction

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) declared a pandemic after its rapid spread across the globe, it was named as corona virus disease 2019 (COVID-19) [1]. According to the World Health Organization (WHO), people of all ages might catch the infection. However, elderly and people with underlying medical co-morbid conditions are at a higher risk of getting severe disease. These groups require increased level of protection as emphasized by the WHO [2].

Population survey is defined as any clinical activity done to identify hidden or unrecognised disease or defects by means of tests, examinations or other procedures that can be applied rapidly. The survey is intended to detect people who do not have any symptoms of the disease, or condition being screened and can identify a pre-disease abnormality or early disease [3]. It is worth noting that screening for any disease is performed with intention to estimate the hidden cases to reduce the burden of the disease, mortality and morbidity, which does not guarantee disease prevention or cure if it occurs, despite that it is a vital step in successful pandemic planning. For any screening including COVID-19, there is a direct association between number of tested cases and accuracy disease spread estimation. The intensity of COVID-19 could be derived from the weekly number of positive

specimens over specimens tested and/or the weekly number of confirmed cases over the number of influenza-like illness consultations if testing ability is limited [4].

Covid-19 is a significant health problem worldwide with a fear of being unstoppable. It has wide spectrum of manifestations varying in severity from asymptomatic infection to severe viral pneumonia with acute respiratory syndrome, and death [5], not all cases are clinically significant though they can spread the disease. Moreover the course of disease includes an early asymptomatic lab recognisable stage [6], all of these factors make COVID-19 typical target for population screening.

Screening can be considered as a tool to assess diagnostic capacity and efficiency for a given disease, which are fundamental for successful epidemic containment [7]. In West Africa few years back specifically in 2013-2016 Ebola Epidemic was worsened and affected more victims due to poor diagnostic preparedness and capacity [8]. Moreover, screening will help figuring out the proportion of all persons infected with COVID-19 and infection fatality rate which will be of great importance in applying public health measures of COVID-19 in regard to magnitude of spread or possibility of immunity [9]. However, case fatality rate due to COVID-19 is largely dependent on age and comorbidity [10].

Inadequate knowledge about the pathology extent of COVID-19 epidemic challenges public health response and planning [11].

Epidemiology of COVID-19 in Libya

In Libya the index case was reported in Tripoli on 24 of March 2020, the case was imported; he was male returned from Saudi Arabia. Then cases started slowly to accumulate with neglectable mortality, till the 24th of May when a cluster of 20 COVID-19 cases were confirmed together in Southern region of the country, namely the city of Sabha. Since that the epidemiological status of Libya has changed as daily claim of cases became very obvious. To date 6.6.2020 according to "The National Centre for Disease Control- Libya" the total tests done were more than 8840, out of them 239 were the total confirmed cases, 52 recovered and five deaths [12].

The risk of COVID-19 spread is expected to be exacerbated by the levels of insecurity, political fragmentation, unsatisfactory people attitude and obedience to closure regulations, weak health and surveillance system and high numbers of migrants and refugees [13].

Problem Statement

There is a prevailing suggestion by some practicing health care providers in the Eastern region of Libya on possibility of occurrence of COVID-19 since early winter of 2019-2020, this suggestion was supported by the observation of an increased frequency of cases of a highly morbid flu-like illness with the need for hospital admission and some of them needed intensive care besides few deaths. In addition to that, some ICU staff contracted infection which caused frequent work absenteeism due to their illness, furthermore, they reported family member cross infection.

In the city of Benghazi the second biggest city in Libya, the index COVID19 case was confirmed on April the 7th of 2020, the diagnosed case was a 53-year-old Libyan male who gave history of being abroad and came back from Turkey through Tunisia. Luckily only three household contacts were tested positive after rapid tracing and screening for all index case contacts, all the cases were managed successfully and recovered. They were discharged two weeks later after negative PCR, and were instructed to stay home isolated for further two weeks, along with wearing surgical masks when necessary [14]. After this small outbreak the city and the whole Eastern region of Libya continue with zero cases till the date of this report writing (6.6.2020).

The idea of population screening emerged to confirm the clearance of the city and to prove or refute the mentioned suggestion of developing COVID19 epidemic and mistaken as usual flu.

Aims of the screening

The screening was done to obtain information about the epidemiological status of Benghazi population in regard to COVID-19 infection and/or immunity; therefore the specific aims were to:

Search forbidden cases of COVID-19 infection.

Assess the immunity status against COVID-19 infection.

In addition, the screening indirectly can indicate the effectiveness of the measures recommended by "The Consultative Medical Committee to Combat the Corona Epidemic- Benghazi" and population obedience to these measures.

Aims of the screening

Study design

A cross sectional study was conducted in the city of Benghazi, the data was collected from the 2nd to the 7thof May 2020. It was a wide scale population-based study including all geographical areas of Benghazi and all persons irrespective of their age, gender or nationality.

Sample size and power

Sample size calculation was performed to determine the needed number that gives power of 95%. Population size of Benghazi and its surrounding areas is 650629.To detect a 50% prevalence of the infection/ immunity, at a 5% significance level, this resulted in a minimum of 384 participants required to attain the required power. The sample was expanded to 600 participant to account for none response and missing data.

Sampling

The participants were selected by random sampling procedure, multi stages cluster sample was drawn from the different parts of the defined geographical areas taking population density in each area into account to be weighted in the sample. Benghazi was divided into four geographical areas, North, South, West and East. The regions of each geographical area were defined, from each region a part constituting 50% of the region`s area was selected randomly to be the first cluster of the sampling process.

Then from each area 40% of the communities (Mahalas) were selected using Probability proportion to Size (PPS) sampling technique. A fixed land mark has been identified to be the starting point in each mahala, then moving to the houses by taking the first right of the street facing that land mark, then leaving three houses to knock the fourth. A total of 57 starting point was randomly defined (Figure 1).

The next stage was individual selection, Kish selection grid to select members within a household has been used, which was done by registering all persons predominantly living there in a descending order (from the oldest to the youngest), then matching the family size with the first digit of the serial number of the data collection form to finally find the required person.

Data collected

Age, gender, nationality, family size, smoking status, marital status, educational attainment, occupation, blood group, medical history, regular medication use.

Self-reported flu-like symptoms experienced since January 2020 such as fever, cough, sore throat, breathlessness, fatigue headache, and history of diarrhea.

History of travelling abroad since January 2020, moving internally between the Libyan cities and contact with a person was abroad since the same date.

Lab investigations

Nasopharyngeal specimens were collected from all participants for RT-PCR testing.

Blood sample were collected for serological testing for IgG and IgMantibodies.

To determine the presence of infection in the study group Sample collection: The samples were collected by trained rapid response team through nasopharyngeal swabs and transported via virus transport medium according to CDC guidelines [15].

Technique: RT-PCR

Procedure: RNA was extracted using "EZ1 Advanced XL" extraction machine manufactured by QIAGEN.

SARS-CoV-2 infection was confirmed by RT-PCR detection of both betacoronavirus E gene and the specific RdRp genes according to Charité, Berlin protocol [16] recommended by the World Health Organization WHO [17].

To determine the immunological status of the study group:

Technique: A rapid serological test using Lateral flow immunoassay was performed to assess the presence of the specific SARS CoV-2 IgM and IgG antibodies.

Kit: Right Sign kits manufactured by Biotest company Lot No. COV20030003 and the authorized representative is Shanghai International Holding Corp. GmbH (Europe) 20537 Hamburg, Germany.

Test performance: According to the manufacturing company the test combined IgG and IgM sensitivity and specificity is :

Sensitivity is 81.7%

Specificity 96.7%

Ethical considerations

A verbal informed consent was obtained from all individuals involved in this screening. The persons in charge for taking the specimens were well trained on safety measures and personal protection equipment to avoid any harm to both, the investigator and the participant. Incorporation of female investigators in all data collection teams to respect cultural background of our society.

Results

Socio-demographic findings

This screening resulted in a sample of 600 participants, 50.5% male and 49.5% female, their age was ranging from ten years to 90 year, with mean age 38.2 (±17.5).Mean family size was around five members, the vast majority (94.9%) of the sample were Libyan compared to none Libyan nationality. Marital status of the

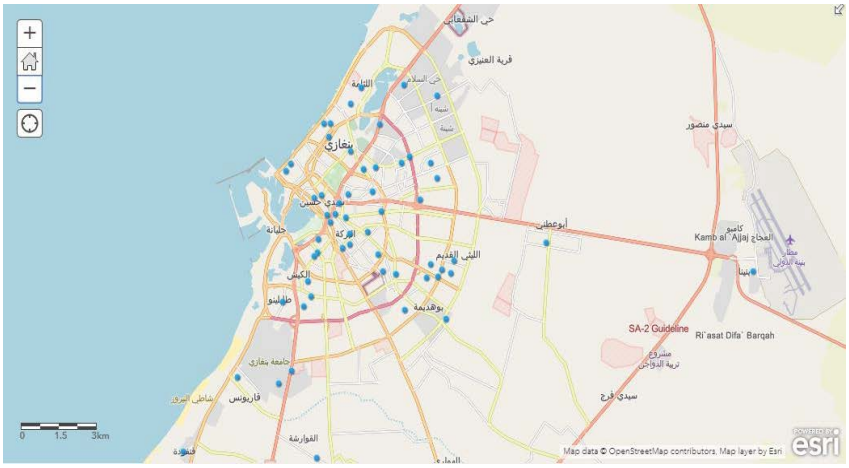

Figure 1 Geographical distribution of the sample.

Table 1: Socio-demographic characteristics of the sample.

Characteristic	Subdivision	Frequency	%
Gender	Male	303	50.5
	Female	297	49.5
Nationality	Libyan	573	94.9
	None Libyan	27	5.1
Marital status	Married	280	46.7
	Single	263	43.8
	Widowed	31	5.2
	Divorced	10	1.6
	Missing	16	2.7
Education level	Illiterate	70	11.7
	Primary- preparatory	152	25.3
	Secondary	145	24.1
	University	175	29.2
	Higher	12	2
	Missing	46	7.7

Table 2: COVID- 19 Related Parameters.

Characteristics	Sub-category	%
Country closure parameters	Returnee from abroad	1.1
	Across cities travelling	4.1
	Household contact with an arrival	0.7
Symptoms	Headache	0.7
	fever	0.5
	Breathlessness	0.5
	Cough	0.3
	Sore throat	0.3
	Diarrhea	0.2
Lab results of swab and Blood sample serology	Negative N/P swab*	100%
	Negative IgM	100%
	Negative IgG	100%

sample was as the following; 46.7 % married, 43.8% single, 5.2% widowed and 1.6% divorced (2.7% missing values). Education level showed that 11.7% of the sample were illiterate, 25.3% primary or preparatory, 24.1% secondary level, 29.2% university qualification and only 2% higher education, with 7.7% missing (Table 1).

Smokers represented 34.8% of adult male participants. The most frequent blood groups were (41.95%), A (37.31%), B (15.67%) and AB (5.08%).

COVID-19 related parameters

Lockdown indicators starting by country borders closures, 1.1 % of the sample reported return back from outside Libya since the beginning of this year. Movement across the Libyan cities was reported by 4.1% of the sample. Only 0.7% admitted household contact with an arrival from abroad (Table 2).

COVID-19 like symptoms was reported in a very small portion of the sample, headache was claimed by 0.7%, fever 0.5%, breathlessness 0.5%, cough and sore throat by 0.3% each and diarrhoea by 0.2% (Table 2).

The result of nasopharyngeal specimen collected from all study sample tested negative. All serological assay for antiCOVID-19 antibodies showed negative results for both IgM and IgG (Table 2).

Discussion

This screening showed a comparable sample in socio-demographic characteristics with the previous figures used for Libyan population; this was evident in gender distribution when compared with the results of last official census done in Libyain 2006 [18] and recent figures provided by The Libyan Centre for Actuarial Studies.

Family size showed lower average compared to previous studies, (six versus five members). The sample showed great similarity in blood group distributions with local studies [19] and international studies. In china, for example, a population-based study of 3.8 million adults confirmed that the A phenotype was the most common, followed by the O, B and AB phenotypes [20]. This finding indicates that the sample is largely representative to the population of Benghazi, and therefore the results are of satisfactory reliability.

Screening for COVID-19 infection is of public health importance, this is because the evidence of some degree of pre-symptomatic period, during which infection propagation by person to person transmission might occur [21].

COVID-19 is known to be transmitted via droplets, despite that alternative mode of transmission remains unknown. Transmission

through infected body fluid or ocular tissue or fluid has been a controversy [22].

Social distancing and personal precaution measures proved to save lives by reducing or stopping person to person transmission of COVID-19. These actions provided an additional time for preparation and containment of the COVID-19 epidemic [23].

About 12 team of infection control and rapid response teams were recruited for data and specimens collection in this screening, each team is formed of an average of five persons and at least one of them is a female to deal with female participants. Additionally, the teams incorporated experts in data collection and spatial domain of houses selection, these teams performed their job in a good level of profession and coherence, they became another advantage of this screening as a step forwards in our preparedness for the possible waves of the epidemic. In agreement with the recommended advice issued by the WHO interim guidance on 19 March 2020, which pointed that to achieve the highest level of effectiveness in the response to the COVID-19 outbreak using the strategies and practices a dedicated and trained teams should be ready [24].

The screening has showed that none of the screened individuals tested positive for active infection nor antibody assay, this result to a great extent logical, as only four cases of the whole target population (population of Benghazi) has confirmed infection and they were recovered for more than two weeks before the beginning of this screening, moreover all the contact were traced and quarantine for two weeks. A seroprevalence study conducted in Los Angeles county found a prevalence of 4.65% for COVID-19 antibodies, which means that approximately367000 adults had been infected and recovered, the study was undertaken at time of declaring 8430 persons in Los Anglos with confirmed cumulative cases, which is significantly less than the study results. This might be the reason under the magnified fatality rates which is based on confirmed cases, while the true prevalence might be higher (25). In addition, under estimation of the real prevalence will hinder contact tracing to limit the spread of infection which subsequently will lead to further uncontrolled transmission [25].

When seropositive results for COVID-19 increase, this will reduce the problem as those with antibodies will halt infection spread and the community will be developing the so-called herd immunity, this value is directly related to the spread rate (R0) which is the number of secondary cases generated due to contact with an infected individual. The minimum level of population immunity to halt the spread of infection in the community would be 1-(1/R0). [26].

In Hong Kong a seroprevalence study for COVID-19 antibodies proved that the disease was imported to the city as only the returnees who were evacuated from Hubei province in March of this year tested positive, the study showed rate of 4% seropositivity of the returnees which confirm the fact about the larger hidden number of infected subclinical cases of COVID-19 [27].

Conclusion

This survey revealed that none of the participants tested positive for SARS-CoV-2 or showed antibodies against COVID-19. This means that there are no active undetected cases of the disease; in addition to that, COVID-19 infection was not circulating in Benghazi population prior to the study time. These results were highly expected, despite that it poses greater challenge for further precautions and preparedness by The Consultative Medical Committee to continue and even raise the measures of health care system readiness and population education to help in epidemic containment and control.

The negative results should not reduce the value of this screening, one of the valuable advantages of this survey is the evaluation of our potential and diagnostic capacity, we passed through a condition mimics the epidemic, there were increased number of blood samples and swabs flowed to the laboratory each day, with continuing receiving samples from suspected case came from triage unites. The laboratory staff showed an excellent level in dealing with samples and issuing the results.

Limitation of the screening

Population of age group 0-9 years were under-represented due to their parent`s refusal, therefore age groups started from 10 years. This was compensated by conduction a hospital-based screening in Benghazi Paediatric Hospital emergency room targeted paediatric cases with flu like-illness.

Acknowledgment

The group expresses their gratitude to Social Security Fund-Libya for their contribution in this screening. The research group is deeply grateful to all teams of data collection and to the population of Benghazi for their cooperation.

Data and samples collection teams

Rapid response team

Rafaa Elwaddani, Ahmad Elfergani, Saleh Aleribi, Abdulsalam Alemami, Zakaria Faraj, Mohammed Alganashi, Ali Esbyi, Faraj algetrani, Mohammed Alshakmak, Mohammed AlGatroni, Farhat Albaraasi, Ahmad Alfitori, Rateba Yahya, Abubaker Alrejbani, AbeerJamal, Rania Rezg, Fadwa Alfaidi, Abdullah Algetaani, Huda Alhassi, Abdulrahman Azooz, Hend Aljebali, Neama Alshaari, Mona Alabaidi, Fayza Abuzrida, Rafaa Alhadad, Rafaa Myaar, Amal Alshatshat, Hatem Altalhi, Salaheddein Alsharaa, Fatema Alsaeti, Mohammed Alagori, Hafeth Alabbar, Ruwida Ehssona, Hajer Suood, Rasha Benswid, Alaa Alwerfalli, Naema Aldenali, Noureldein Alhadad, Basma Almehdawi, Seraj Alfallah, Jameela Okasha, Saed Alseleni, Najia Alawami, Hatem Moamen, Entessar Altiera, Wafa Altargi, Soaad Almesmari, Ahmad Ehwidi, Emad Almeshiti, Salah Alorfi, Wafa Abdubar, Amna Alobidi, Abduaziz Alsaghair, Tefaha Almughrabi, Alsadga Ghreesh, Majdeddein Ageeb.

Libyan Center for Actuarial Studies team

Ateia A. Ateia, Alhassan Alsalheen, Ayman Almishiti, Almabrook F. Almabrook, Abeer Alkilani, Zyad Alhawaz, Abdulaziz Saeed, Khalefa Ebryka, Ayman Abuazza, Makki Muftah.

References

1. Lu CW, Liu XF, Jia ZF (2020) 2019-nCoV transmission through the ocular surface must not be ignored. Lancet 395:e39.

2. World Health Organization (2020) Coronavirus disease 2019 (COVID-19): situation report.

3. Last JM, Spasoff RA, Harris SS (2000) A Dictionary of Epidemiology, 4th edn. London: International Epidemiology Association. (Classic resource for definitive definition of terms relating to epidemiology).

4. European Centre for Disease Prevention and Control (2020) Strategies for the surveillance of COVID-19. Stockholm: ECDC.

5. Zhu N, Zhang D, Wang W, Li X, Yang B, et al. (2020) A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med 382:727-33.

6. Callaway E (2020) Time to use the p-word? Coronavirus enter dangerous new phase. Nature 579:12.

7. Kelly-Cirino CD, Nkengasong J, Kettler H, Tongio I, Gay-Andrieu F, et al. (2019) Importance of diagnostics in epidemic and pandemic preparedness. BMJ Glob Health 4:e001179.

8. Centres for Disease Control and Prevention (CDC) (2016). Cost of the Ebola epidemic.

9. Russell TW, Hellewell J, Jarvis CI, van Zandvoort K, Abbott S, et al. (2020) Estimating the infection and case fatality ratio for coronavirus disease (COVID-19) using age-adjusted data from the outbreak on the Diamond Princess cruise ship. Euro Surveill 25: 2000256.

10. Linton NM, Kobayashi T, Yang Y, Hayashi K, Akhmetzhanov AR, et al. (2020) Incubation period and other epidemiological characteristics of 2019 novel coronavirus infections with right truncation: A statistical analysis of publicly available case data. J Clin Med 9:538.

11. 2019 Novel Coronavirus (2019-nCoV): Strategic Preparedness and Response Plan (2020). https://www.who.int/docs/default-source/coronaviruse/srp-04022020.

12. The National Centre for Control of Disease Libya. (2020) https://ncdc.org.ly/Ar/libyan-covid-19-dashboard/.

13. WHO (2020). Impact of COVID-19 prevention measures on humanitarian operations for Health Sector, Libya.

14. The Consultative Medical Committee to Combatthe Corona Epidemic- Bengazi (2020).

15. Centers for Disease Control (CDC) (2020). Interim Guidelines for Clinical Specimens for COVID-19.

16. Corman V, Bleicker T, Brünink S, Drosten C (2020) Diagnostic detection of 2019-nCoV by real-time RT-PCR: Users Looking for a Workflow Protocol Consult the Last Three Pages of This Document.

17. WHO Global (2020). Molecular assays to diagnose COVID-19: Summary table of available protocols (in house assays). COVID-19 WHO Lab diagnosis 3:1-80.

18. The final results of general population census for year 2006. http://www.bsc.ly/#.

19. Saad KAO (2016) Distribution of ABO Blood Groups And Rhesus Factor (RH) in ALBIYDA / LIBYA. Journal of Medical and Dental Science Research 3:28-31.

20. Liu J, Zhang S, Wang Q, Shen H, Zhang Y, et al. (2017) Frequencies and ethnic distribution of ABO and RhD blood groups in China: a population-based cross-sectional study. BMJ Open 7:e018476.

21. Toner E, Waldhorn R (2020) What US Hospital Should Do Now to Prepare for a COVID-19 Pandemic.

22. Seah IYJ, Anderson DE, Kang AEZ, Wang L, Rao P, et al. (2020) Assessing Viral Shedding and Infectivity of Tears in Coronavirus Disease 2019 (COVID-19) Patients. Ophthalmology 127:977-979.

23. World Health Organization (2020) Critical preparedness, readiness and response actions for COVID-19: Interim guidance.

24. World Health Organization (2020) Infection prevention and control during health care when COVID-19 is suspected: Interim guidance.

25. Sood N, Simon P, Ebner P, Eichner D, Reynolds J, et al. (2020) Seroprevalence of SARS-CoV-2–Specific Antibodies Among Adults in Los Angeles County, California, on April 10-11, 2020. JAMA 323:2425-2427.

26. Lytras T, Panagiotakopoulos G, Tsiodras S (2020) Estimating the ascertainment rate of SARS-CoV-2 infection in Wuhan, China: implications for management of the global outbreak. medRxiv. 20042218.

27. To KKW, Cheng VCC, Cai JP, Chan KH, Chen LL, et al. (2020) Seroprevalence of SARS-CoV-2 in Hong Kong and in residents evacuated from Hubei province, China: a multi-cohort study. The LANCET Microbe 1:E111-E118.