

MediPIET Summary report of work activities

Emna MZIOU

Tunisia, Cohort 5 (2022)

Background

About MediPIET

The Mediterranean and Black Sea Programme for Intervention Epidemiology Training (MediPIET) aims to enhance health security in the Mediterranean and the Black Sea region by supporting capacity building for prevention and control of natural or man-made threats to health posed by communicable diseases. It is a competency-based **in-service two-year fellowship** during which selected fellows conduct projects and field investigations at a MediPIET Training Site in their home country and attend MediPIET modules.

Since mid-2021, MediPIET has been implemented by ECDC as a part of the [EU Initiative on Health Security](https://www.ecdc.europa.eu/en/training-and-tools/training-programmes/fellowships/medi Piet). You can find more information about the programme at: <https://www.ecdc.europa.eu/en/training-and-tools/training-programmes/fellowships/medi Piet>.

Pre-fellowship short biography

Emna MZIOU, MD, is a medical doctor in preventive and community medicine in Tunisia (MD was obtained in November 2023) from the Sfax Faculty of Medicine.

She is a medical resident in preventive and community medicine and, during her four-year residency, she worked in different national and local medical facilities and departments including epidemiology and IPC (Infection prevention and control). MediPIET coincided with the epidemiology residency period. Emna's time during both her residency and the MediPIET fellowship was focused on field epidemiology in different institutes at a national level. She then specialised in hospital field epidemiology, which is hospital hygiene and IPC in Tunisian Hospitals.

In addition, she was an FETP BFE (Basic Field Epidemiology) graduate from cohort 2021.

- During the residency period, she worked with the National Observatory of New and Emerging Diseases (ONMNE): national surveillance structure, she worked on COVID-19 surveillance and research, a Shigellosis outbreak in 2022 and West Nile outbreak in 2023.
- Salah Azaiez Epidemiology department: Cancer registry in Northern Tunisia (incidence, trend, prediction and burden of diseases).
- Institut Pasteur de Tunis, Medical epidemiology department: She worked on research into malaria prevention measures.
- Hospital Hygiene department, Sahloul University Hospital: She worked in infection prevention and control, outbreak management and carried out research.
- Hospital Hygiene department, Habib Bourguiba University Hospital (current affiliation).

Fellowship

In September 2022, Emna Mziou started her MediPIET fellowship at the National Observatory of New and Emerging Diseases in Tunisia. This report summarises the work performed during the fellowship.

National supervisors: Aicha Hechaichi (supervisor), Nissaf Bouafif ép Ben Alaya (general director of training site).

Scientific coordinator: Natalie Girin.

Fellowship projects

Surveillance

Analysing outputs of a surveillance system (COVID-19 in Tunisia): Transmission indicators of the COVID-19 outbreak in Tunisia; March 2020 to December 2022

Introduction: COVID-19 was officially declared a public health emergency of international concern on 30 January 2020. The first case in Tunisia was reported on 2 March 2020.

Our aim was to describe the COVID-19 outbreak in Tunisia between March 2020 and December 2022, and to follow the evolution of the main indicators of viral transmission during the different phases and waves of the outbreak.

Methods: We conducted a national longitudinal descriptive study. Data were collected prospectively on a daily basis. We analysed epidemiological surveillance data from COVID-19 tests performed from when the first case was recorded until December 2022. The transmission indicators studied were screening and positivity rates, the cumulative incidence and the effective reproduction rate.

Results: The evolution of the COVID-19 outbreak was marked by two phases of different community transmission. The first phase lasted from 2 March 2020 to 17 August 2020, characterised by weak community transmission around imported cases. The second phase was characterised by horizontal autochthonous community transmission and involved five waves. The first two waves were dominated by the circulation of the wild variant of SARS-CoV-2 and recorded an increase in transmission indicators compared to the first phase. Between March and May 2021, genomic surveillance identified the predominance of the new Alpha VOC. Thereafter, the epidemic curve showed a continuous recrudescence of viral circulation marking the fourth wave dominated by Delta VOC until December 2021. In 2022, the increase in the number of confirmed cases was rapid, and this wave was associated with the predominance of Omicron VOC.

Conclusion: Analysis of the national outbreak situation, transmission indicators and genomic surveillance in Tunisia made it possible to adjust the preventive health and social measures taken.

Role: Emna was the principal investigator of this descriptive study. She was responsible for data collection and cleaning with the team of the ONMNE. Data analysis was done with the help and the guidance of a biostatistician and the General Director of ONMNE (Pr Nissaf). Data reporting, writing of the manuscript and the report and interpretation of the results and discussion were undertaken by Emna, supervised by Dr Aicha and Pr Nissaf.

Output: The output of this study (Transmission indicators of the COVID-19 outbreak in Tunisia, Rex 3 years of COVID) took the form of a report to the Ministry of Health (season 2021/2022), a report to the institute and as a MediPIET deliverable, a Medical Thesis of Doctorate (Candidate Emna MZIOU, November 2023). It is also a manuscript to be published.

Supervisor(s): Nissaf Bouafif ép Ben Alaya, Aicha Hechaichi

Status: Completed.

Healthcare associated infections: prevalence and associated factors in Habib Bourguiba University Hospital 2024

Introduction: Healthcare-associated infections (HAI) are a major public health issue due to significant related morbidity, mortality and increased costs. In Tunisia, the most recently published national and regional (in Sfax, Tunisia) HAI prevalence studies were in 2012, 2017 and 2019 respectively.

This study aimed to determine the prevalence of HAI in a hospital in Sfax, Tunisia in 2024, and identify factors associated with HAI.

Methods: A point-prevalence study was conducted from 10–22 June 2024 in Habib-Bourguiba hospital in Sfax-Tunisia. It included all patients hospitalised for a minimum of 48 hours (even patients discharged and readmitted for HAI). We calculated adjusted Odds-Ratio (aOR) using binary logistic regression to identify factors associated with HAI adjusted for intensive-care unit (ICU) admission.

Results: Of 227 patients, 40 patients had at least one HAI, giving a HAI prevalence of 17.6% (95% CI 12.8–22.5). The HAI prevalence was respectively 46.7% (95% CI 29.2–65.4) and 13.9% (95% CI 8.9–19.6) in ICU (Intensive care unit) versus non-ICU departments.

Factors independently associated with having at least one HAI were admission in ICU (aOR=5.7, 95% CI 2.4–13.3), obesity (aOR = 4.2, 95% CI 1.5–12.1), being 60 years and more (aOR=2.7, 95% CI 1.1–7.4), antibiotic use in the past 6 months (aOR = 2.5, 95% CI 1.1–5.7), and peripheral venous catheter (aOR = 1.6, 95% CI 1.1–2.5).

Conclusion: Our study fills a critical gap in the literature at the national and regional levels. It revealed a high prevalence of HAI in Habib-Bourguiba Hospital compared to similar studies in other regions. Consequently, we recommended optimising HAI surveillance, planning for resources, and setting up operational hospital hygiene programmes for healthcare professionals in order to create a culture of patient safety.

Role: Emna was the principal investigator of this point prevalence study. As a medical doctor working in the hospital hygiene department, she was responsible for data collection, investigating in the field in the medical records of hospitalised patients (to look for HAIs). Data analysis, data reporting, writing of the manuscript and the report as well as interpreting the results and discussion were undertaken by Emna and other medical doctors from the hospital hygiene department in the Habib Bourguiba university hospital.

Output: The output of this study (prevalence of healthcare associated infections in this hospital) took the form of reports to the heads of departments in the hospital, a report to the hospital administration and there is a manuscript to be published.

Supervisor(s): Pr Kassis Mondher

Status: Completed.

Outbreaks

Control of candidiasis outbreak in an intensive care unit in southern Tunisia, 2024

Introduction: *Candida* is an emerging pathogen responsible for healthcare-acquired-infections (HAI), particularly in frail or infirm patients. This germ is frequently responsible for outbreaks. We aimed to describe the candidosis outbreak investigation in the medical intensive care unit (MICU) of the Habib Bourguiba University Hospital in southern Tunisia, the measures implemented and the follow-up.

Methods: Following the alert issued by the hospital pharmacy concerning the overuse of antifungals by the MICU, the hospital-hygiene team went on site to investigate. This was a retrospective study among MICU patients hospitalised in January-February 2024. The investigation was based on the review of medical records, inspection of equipment and practices and environmental samples. A case was defined as a patient having a laboratory detection of *Candida tropicalis* or *Candida Albicans* at least 48 hours after admission to the MICU.

Results: This was an outbreak of *Candida albicans* and *tropicalis* infection affecting five patients in the MICU. The attack rate was 22.73%. The synoptic table showed that there was an overlap of hospitalisation periods. We identified seven anatomic swabs of an identical strain of *Candida albicans* and three others of identical strains of *Candida tropicalis*. The mapping and the epidemic curve showed the tempo-spatial dynamic of the outbreak in Unit 2 of the MICU sharing the same staff, nursing cart and hand-wash station. Swabs of environmental elements (syringe pumps, soap disposers, beds, medication shelves) and staff hands in Unit 2 did not detect any identical germ. Urgent measures were taken for patients (septic isolation, individualisation of care and application of contact-type precautions) and for healthcare workers (bio-cleaning and standard precaution trainings to reinforce hand-hygiene practices). Two months later, no further cases of Candidiasis had been found.

Conclusion: Although a HAI surveillance system existed in the hospital, the candidiasis outbreak was declared through the pharmacy. Continuous surveillance, hygiene training and a rapid response capacity for cases or outbreaks of HAI are essential to control the spread of germs among patients.

Role: Emna participated in every step of this outbreak investigation. This outbreak occurred when she was working as a medical resident in the hospital hygiene department of Habib Bourguiba University Hospital. The outbreak alert came from the pharmacy of the hospital in relation to overuse of antifungals.

The team consisted of two doctors (including Emna) and two technicians in hospital hygiene went on site to investigate. Emna was in charge of seeing the patients (who were still hospitalised) and looking for the medical records in the medical files. She did the analysis of the cases, the epidemic curve, temporal and spatial mapping of the medical ICU and discussed the possible hypothesis, as set out in the report sent to EVA.

The action taken involved multiple trainings on bio cleaning, management of healthcare waste, hand hygiene and reporting of healthcare-associated infections, delivered by the whole team. We are still doing passive and active surveillance of new cases in the MICU but no new cases have been registered.

Principal investigator: Emna.

Output: A feedback report to the medical intensive care unit of the hospital, the administration and the hospital pharmacy. It also served as a MediPIET outbreak investigation report. This was submitted and accepted as an abstract at a local hygiene conference. This report will not be published elsewhere. It consists of routine work done by the hospital hygiene department.

Supervisor: Pr Mondher Kassis

Status: Completed.

Research

Epidemiological study- Operational research

Breast cancer knowledge, perception, attitude and practices among women diagnosed with BC in Northern Tunisia

Objective: This study aimed to assess breast cancer (BC) knowledge, perceptions, attitudes, and practices among women diagnosed with breast cancer in North Tunisia and to investigate the associated factors.

Methods: A cross-sectional survey was conducted from March to June 2023 at the Salah Azaiez Institute in Tunis. We included women diagnosed with breast cancer. The minimum sample size was 87 patients. Data were collected using a paper questionnaire and consisted of five sections on the patient's information, BC knowledge, perception, attitudes and practices. We performed a linear regression analysis and calculated adjusted Odds-Ratios (aOR) with 95% confidence interval (95% CI) to measure the association of the studied factors with the sections' scores.

Results: We included 115 women diagnosed with BC. The mean BC knowledge and awareness score was $68.7\% \pm 16.5$. The factors independently associated with a high knowledge score were urban residence ($p=0.049$, $aOR=2.91$ [95% CI 2.04–7.86]), higher educational level ($p=0.043$, $aOR=15.05$ [95% CI 9.42–20.68]), family history of BC ($p<10^{-3}$, $aOR=6.68$ [95% CI 2.61–10.74]) and age of the tumour ($p<10^{-3}$, $aOR=2.976$ [95% CI 2.11–3.84]).

The mean BC perception score was $56.3\% \pm 12.4$. Lower educational level ($p<10^{-3}$, $aOR=12.12$ [95% CI 8.09–16.148]) and not having a family history of BC ($p=0.005$, $OR=5.78$ [95% CI 1.80–9.76]) were the factors associated with bad perception of BC. A lower level of education ($p=0.002$, $aOR=2.12$ [95% CI 1.21–5.35]) was associated with a poor attitude to examination. The mean BC good practices score was $53.7\% \pm 23.7$. A higher educational level was associated with good BC practices ($p=0.001$, $aOR=2.09$ [95% CI 1.46–2.73]).

Conclusion: Recognising the multifaceted nature of factors associated with BC knowledge, perception, attitudes and practices among patients is crucial for decision-makers when designing targeted interventions that empower women with accurate information and foster positive attitudes towards breast health.

Role: Principal investigator:

In the context of her residency, Emna was located at Salah Azaiez Institute in the Epidemiology department (reference hospital for cancer diagnosis and therapy).

During her work at the reference hospital, in addition to being in charge of the cancer national register, Emna undertook her research project.

Emna was in charge of writing the protocol, collecting data (115 patients), cleaning the dataset, analysing data, writing the manuscript and submitting it.

Hyem Khiari was in charge of validating and correcting the manuscript.

Output: This manuscript was submitted to BMC Women's Health (rejected) and has now been submitted to the Egyptian National Cancer Institute and is still under review.

Supervisor: Dr Hyem Khiari

Status: Completed. (Waiting for acceptance).

Scientific communication

Conference presentations

ESCAIDE 2023, Barcelona Spain

- Mziou E, Dhaouadi S, Hchaichi H, Ben Youssef F, Letaief H, Guermazi S, Safer M, Derouiche S, Bouabid L, Bougatef S, Elmili S, Rebhi M, Bouafif ép Ben Alaya N. **Risk factors for household transmission of *Shigella* during an outbreak in Tunisia, July-November 2022.** ESCAIDE 2023, Barcelona, Spain (Poster presentation).

Publications and outputs

- E Mziou, H Khiari, M Gargouri, M Hsairi. **Stage-specific treatment costs for cervical cancer in the Salah Azaiez Institute of cancer in Tunisia.** Biomedicine & Healthcare Research January 2024; 2:24-28. <https://doi.org/10.5281/zenodo.10570006>.
- Emna Mziou, Aicha Hchaichi, Hejer Letaief, Sonia Dhaouadi, Mouna Safer, Khoulood Talmoudi, Rim Mhadhbi, Nawel Elmili, Leila Bouabid, Sondes Derouiche, Souha Bougatef, Hedia Bellali, Nissaf Bouafif ép Ben Alaya. **Vaccine effectiveness against COVID-19: A test negative case-control study in Tunisia, August 2021.** Vaccine, Volume 42, Issue 7, 2024, Pages 1738-1744, ISSN 0264-410X. <https://doi.org/10.1016/j.vaccine.2024.02.028>
- Dhaouadi S, Ben Youssef F, Mziou E, Hechaichi.A, Letaief H, Mhadhbi R, Guermazi S, Larouchi F, El Mili N, Jlassi S, Nasri N, Derouiche S, Rabhi M, Bouafif ép Ben Alaya N. **Epidémie de Shigellose en Tunisie: Bulletin de veille et de riposte au 08/01/2023 (S01/2023).** 2023. National Observatory of New and Emerging Diseases, Tunis. Tunisia. (<https://onmne.tn/wp-content/uploads/2023/01/SHIGELLOSE-BULLETIN-N%C2%B01-2023.pdf>)
- Dhaouadi S, Ben Youssef F, Mziou E, Hechaichi.A, Letaief H, Mhadhbi R, Guermazi S, Larouchi F, El Mili N, Jlassi S, Nasri N, Derouiche S, Rabhi M, Bouafif ép Ben Alaya N. **Epidémie de Shigellose en Tunisie: Bulletin de veille et de riposte au 23/01/2023 (S03/2023).** 2023. National Observatory of New and Emerging Diseases, Tunis. Tunisia. (<https://www.onmne.tn/?p=17216>)

Teaching activities

Vaccine-effectiveness studies: how to write a protocol

Date, duration, and location of the teaching activity: On 19 October 2022 - whole day activity (seven hours).

Location: Golden Tulip- el Mechtel Hotel, Tunis, Tunisia (Module 5 of T-FETP cohort-4).

Target audience: Cohort-4 T-FETP fellows (13 fellows)

Description of the teaching activity:

The teaching activity was spread over a whole day (3rd day of Module 5 of T-FETP cohort4). The teaching focused on defining vaccine effectiveness (term, definitions, calculations) and the main elements of writing a protocol and how to write one.

This was followed by an example of a protocol to develop: a second national study about vaccine effectiveness against COVID-19 in Tunisia.

The morning session was devoted to presentations followed by a case study. First, we started with a lecture on the definition of vaccine effectiveness, how to calculate vaccine effectiveness, and what methods to use. Then in a second presentation, we presented the protocol of the national study conducted in 2021, and the gaps, biases and challenges we had faced when we conducted it.

After the presentations, we distributed the case study to the participants. Questions were about the importance of conducting this requested second study (explanations and justifications). We then looked at how to write and what to include in the discussion.

Each part of the morning session was followed by a presentation/explanation that taught students what to do and what not to do when stating the justifications for the study and writing the discussion.

We also presented and simplified the WHO guide (on VE studies and protocols).

The afternoon session was devoted to how to write and what to put in the Methods section. Each group of participants had to discuss the study design that they thought was most suitable (pros and cons of every study type) and then write some bullet points in the methods of their fictive protocol. The groups presented their thoughts and discussions. The last hour of the day was dedicated to comments and questions.

Learning objectives for this teaching activity

- By the end of the session, the learner needed to understand, know how to calculate and be able to define vaccine effectiveness (VE). They needed be able to differentiate between clinical, serological and epidemiological studies of VE.
- Participants were also be able to determine study designs that are applicable on VE studies and choose what was suitable in our national context (pros and cons of every study design), and what would be most appropriate for solving problems when faced with a similar study.
- Participants were able to remember the main parts of a protocol and apply what they had learnt in a draft protocol (bullet points). They also had to design their own protocol.

International Assignments

Learning best practices for infection prevention and control that can be implemented in Tunisian hospitals, based on examples of practices and solutions used in Mater Dei Hospital in Malta.

Visit to infectious disease prevention and control unit in Malta to learn about surveillance of communicable diseases and outbreak management at national level

Background

Healthcare-acquired infections (HAIs) are a public health concern. In Tunisia, HAIs are not mandatory notifiable diseases at national level. The Habib Bourguiba University Hospital (HBUH) is a tertiary surgical hospital in southern Tunisia. HBUH has been in operation since 1985 although the hospital hygiene department at this university hospital did not open until 2022.

HAI surveillance is quite challenging to implement, both in hospitals and on a national basis. Emna has worked for the last three years with the National Observatory for New and Emerging Diseases on disease surveillance and outbreak management. Since 2024, she has been affiliated to the hospital hygiene department at HBUB in southern Tunisia, working on HAI surveillance and control on a local basis.

Aim

- To learn about the structure and operation of the national surveillance system of communicable diseases and outbreak management in Malta.
- To improve the infection prevention and control system at the HBUB hospital, based on examples of good practices and solutions used in Mater Dei Hospital.

The visit to Mater Dei Hospital's Infection Prevention and Control (IPC) Department provided a comprehensive overview of the practices and protocols used to maintain high standards of hygiene, control HAIs, and combat AMR. The hospital's structured, evidence-based approach can offer valuable lessons for Tunisia's hospitals to enhance their own infection control and patient safety measures.

1. **Hospital Hygiene and Environmental Cleaning Protocols:** At Mater Dei, hospital hygiene is maintained through stringent cleaning protocols that are regularly audited. The hospital uses a standardised cleaning protocol that includes daily cleaning schedules, frequent disinfection of high-touch surfaces, and the use of UV light and other technologies to reduce environmental contamination. For HBUH: Consider investing in advanced cleaning technologies, such as UV light disinfection, especially for high-risk areas such as ICUs and operating rooms.
2. **Surveillance of Healthcare-Associated Infections (HAIs):** Recommendation for Tunisia - develop a national HAI surveillance programme, with dedicated infection control teams at every hospital. These teams should be responsible for collecting data, analysing trends, and implementing infection control measures. Hospitals could be required to report HAI rates to a central health authority for monitoring and benchmarking purposes.
3. **Central Sterile Services Department (CSSD):** Mater Dei's CSSD is well-structured, with strict sterilisation procedures for surgical instruments and medical devices. The department follows international best practices, ensuring that all instruments undergo rigorous decontamination, packaging, and sterilisation before reuse.
4. **Hand Hygiene Audits and Promotion:** Hand hygiene is a cornerstone of infection prevention at Mater Dei Hospital. The hospital runs regular hand hygiene audits and actively promotes hand hygiene compliance through campaigns and posters. Hand sanitisers are readily available throughout the facility. We need to implement routine hand hygiene audits at HBUH and launch national awareness campaigns to promote hand hygiene among healthcare workers and the public. Hospitals should be equipped with alcohol-based hand sanitisers at strategic points, particularly in high-traffic and high-risk areas.
5. **Antimicrobial Resistance (AMR) Monitoring and Control:** We need to establish antimicrobial stewardship programmes in hospitals to monitor antibiotic use, reduce over-prescription, and promote the use of appropriate antimicrobial therapies. This should include regular training for clinicians on AMR, the judicious use of antibiotics, and adherence to treatment guidelines.

Recommendations to HBUH

Enhanced patient education: Patients and visitors should also be educated on infection prevention measures, such as hand hygiene and the appropriate use of antibiotics, to further support the hospital's efforts.

Improve waste management: Tunisia should strengthen waste disposal protocols in hospitals, particularly for biomedical waste, to minimise infection risks related to improper handling and disposal.

Engage in international collaboration: Partner with international institutions for research on HAIs and antimicrobial resistance and participate in global initiatives aimed at controlling AMR and improving IPC practices.

Hosting country and institute: Infectious Disease Prevention and Control Unit (Health Promotion and Disease Prevention) in Malta/Infection Prevention Unit in Mater Dei Hospital, Malta.

Host site supervisor: Dr. Maria-Louise Borg.

MediPIET modules attended

1. Introductory Course: Sep 26 – Oct 7, 2024: Spetses, Greece.
2. Introduction to R/Stata: 28 November - 1 December 2024: virtual
3. Outbreak Investigation module: 5-9 December 2024– Berlin.
4. CBRN: chemical, biological, radiological and nuclear risks: 13-17 February 2024: Montenegro.
5. Vaccinology Inject day: 29 March 2024: virtual.
6. Multivariable Analysis Module: 22-26 May 2024: Frankfurt.
7. Project Review 2023: 28 August - 1 September 2024: Lisbon, Portugal.
8. Time Series Analysis + GIS: 11-15 Dec 2024: Rome.
9. One Health Module: 3-7 June 2024: Serbia.
10. Project Review Module 2024: 26-30 August, Lisbon, Portugal.

Personal conclusions of fellow

Completing the two-year MediPIET fellowship has been an invaluable experience, providing me with a deeper understanding of field epidemiology and its real-world applications. I had the privilege to work alongside dedicated professionals and to be mentored by experts in the field, which helped sharpen my skills in outbreak investigation, surveillance, and public health interventions.

The hands-on learning and exposure to diverse epidemiological challenges was both demanding and rewarding. This fellowship not only enhanced my technical competencies but also strengthened my ability to work effectively under pressure and collaborate with multidisciplinary teams. I leave this programme feeling well-prepared and more passionate than ever about contributing to public health at both national and international levels.

Connecting with professionals from diverse fields and perspectives has broadened my understanding and enriched my experience. When it comes to the MediPIET fellowship, I would highly recommend it to my colleagues, and I am eager to build on the knowledge and skills I have gained as I move forward in my career.

Acknowledgements

I would like to express my sincere gratitude to my mentors, supervisors, and colleagues at my training site, whose guidance and encouragement have been invaluable throughout this fellowship. I also deeply appreciate the support of the MediPIET programme and ECDC coordinators whose efforts made this enriching experience possible. Thanks to everyone who contributed to my learning journey and helped me accomplish the programme's objectives.