

MediPIET Summary report of work activities

Zakaria Lakhdari Elboukhari

Libya, Cohort 6 (2023)

Background

1. 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 2-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 is 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/medipiet). You can find more information about the programme at: <https://www.ecdc.europa.eu/en/training-and-tools/training-programmes/fellowships/medipiet>

2. Pre-fellowship short biography

Zakaria obtained his medical degree from the Faculty of Medicine, University of Tripoli, Libya. From July 2021 to December 2021, he worked as an intern at Mitiga Hospital, Tripoli, gaining experience in managing critically ill patients and coordinating multidisciplinary care. From January 2022, he served as a medical doctor in the hospital's intensive care unit, where his participation in emergency preparedness during the COVID-19 response strengthened his interest in population health and epidemiology. Since November 2022, Zakaria has been working at the National Centre for Disease Control (NCDC) in Tripoli. He first joined the Planning Department, contributing to strategic emergency response planning, field epidemiology meetings, and workshops. He later moved to the Public Health Emergency Operations Centre (PHEOC) as an Operations Officer, where he coordinated field surveillance and rapid response activities, supported outbreak investigations, and contributed to data management and reporting for national and international partners.

Fellowship

In September 2023, Zakaria started his MediPIET fellowship at the National Centre for Disease Control (NCDC), Tripoli, Libya. This report summarizes the work performed during the fellowship.

National supervisor: Zeinab Saleh

Scientific coordinator: Pawel Stefanoff

Fellowship projects

1. Surveillance

Evaluation of active syndromic surveillance in Zliten, Libya, January-June 2024

Introduction: In early 2024, the city of Zliten, Libya, experienced recurrent flooding caused by rising underground water levels, leading to surface contamination and an increased risk of waterborne and vector-borne diseases. In response, the National Centre for Disease Control (NCDC) established an Active Syndromic Surveillance (ASS) to enhance early detection of public health threats during this environmental emergency. This evaluation assessed the system's performance in detecting health events and supporting public health action.

Methods: We evaluated the ASS operation using weekly aggregated data collected from six primary health facilities between January and April 2024. ASS included monitoring of seven syndromes: diarrhoea, rash, rash with fever, chickenpox, leishmaniasis, upper and lower respiratory tract infections (URTI, LRTI). We assessed simplicity by reviewing the ASS structure and operation, and interviews with key actors. We assessed timeliness by measuring the delay between the end of the reporting week and data submission. We assessed data quality by calculating the proportion of non-missing weekly data. We assessed usefulness by reviewing how the detected events contributed to the public health response.

Results: Although paper-based and challenging to implement, ASS was simple to operate and did not overburden participating facilities. All six facilities reported weekly data on time. Completeness was almost 100% for weekly aggregated reports after full implementation, though demographic and laboratory data were not included. Diarrhoea and URTI accounted for 80 % of all cases, with notable peaks in weeks 6 and 11. The system informed some timely interventions, including environmental spraying and water quality testing following detection of leishmaniasis and diarrhoeal clusters. Feedback from NCDC to municipal level occurred with administrative delay (three to four days) due to administrative workflows.

Conclusions: The ASS effectively enhanced early detection and intersectoral coordination during the flooding emergency. It was simple, timely, collected good quality information and was useful in informing timely interventions. Despite limitations in the amount of data collected, feedback flow, and laboratory integration, the system proved a valuable complement to routine surveillance. We recommended further improvements in digitalisation, feedback mechanisms, and inclusion of demographic variables to strengthen future emergency preparedness in Libya.

Role and outputs: Principal Investigator. Zakaria implemented the active surveillance in collaboration with local health authorities, designed the evaluation protocol, analysed the aggregated data, calculated the indicators and prepared the final report.

Supervisor: Zeinab Saleh

Status: Completed

2. Outbreaks

Recurring waterborne diarrheal outbreaks in a migrant residence centre, Tripoli, Libya, October-November 2024

Introduction: Between October and November 2024, an outbreak of diarrheal disease occurred at a migrant residence centre, which hosted 240 women and children under 15 years of age. Twenty residents reported diarrhoea, and five required hospitalisation. This was the third such outbreak in 12 months, following two prior events linked to inadequate water and sanitation (WASH) infrastructure. We investigated to identify the source, describe risk factors, and implement sustainable solutions.

Methods: We defined a case as a resident who experienced ≥ 3 loose stools in 24 hours between 23 October and 11 November 2024. We reviewed medical records, interviewed 80 residents (cases and contacts), and collected eight stool specimens for laboratory testing. We reviewed the history of the water supply. The National Laboratory of Environmental Correction tested water samples from freshwater tanks, filtered water taps, and other taps supplying dormitories for microbial contamination.

Results: We identified 41 cases (mean age 18 years SD: 11 years); 76% (32/41) resided in dormitory A. The first case had symptoms on 25 October. Cases increased between 2 and 13 November with a peak on 6 November, suggesting a common source of exposure. Of 41 cases, 29 (71%) drank unfiltered tap water and nine (22%) drank filtered tap water. While 20 (49%) reported always washing their hands, only seven (17%) had access to soap/sanitizers. Water samples were contaminated with *Escherichia coli* and *Entamoeba histolytica*. Among the eight stool samples tested, four were positive for *Entamoeba histolytica* and one was positive for *Ancylostoma spp.* eggs. Municipal reports confirmed a septic tank leakage 17 weeks prior near the main water source.

Conclusions: Recurrent outbreaks at this site were driven by systemic WASH failures, notably contaminated groundwater and inadequate filtration, lack of access to soap/sanitizers, and meal consumption in dormitories amplified secondary transmission risks. Post-intervention measures halted transmission, demonstrating that targeted WASH interventions and improved monitoring can disrupt disease cycles in high-risk settings.

Role and outputs: Principal Investigator. Zakaria led the outbreak investigation, organised case finding, resident interviews, and coordinated field data collection. He analysed the data and prepared the final report. He successfully submitted and abstract for presentation at ESCAIDE 2025.

Supervisor(s): Zeinab Saleh

Status: Completed

3. Research

Understanding healthcare workers knowledge, attitudes, and practices towards vaccination in Tripoli, Libya, April-July 2025

Background: Vaccination remains a cornerstone of public health, but programme success depends not only on vaccine availability but also on healthcare workers' knowledge, attitudes, and practices (KAP). In Libya, where vaccination services are delivered through primary healthcare centres, gaps in coverage and vaccine acceptance persist. This study assessed knowledge, attitudes and practices towards vaccination among HCWs working in Tripoli, explored barriers and recommendations, and examined associations between demographic factors and KAP scores.

Methods: We conducted a cross-sectional survey among healthcare workers (n = 210) working in randomly selected vaccination centres in Tripoli. A structured questionnaire measured knowledge (on a scale 0-15), attitudes (on a scale 5-25), and practices (on a scale 3-25). We categorised KAP scores into interpretation bands and analysed using descriptive statistics, chi-square tests, t-tests, and ANOVA. We described barriers for delivering vaccinations and recommendations for improving immunisation services.

Results: Overall, 36.7% of healthcare workers had adequate knowledge ($\geq 8/15$), 78% expressed positive attitudes ($>15/25$), and 52% demonstrated good practices ($>15/25$). Knowledge and practice scores were significantly correlated ($r = 0.31$, $p < 0.01$). Practice scores were higher among healthcare workers with ≥ 10 years of experience ($p = 0.02$). The most frequently reported barriers were lack of community awareness (42%) and insufficient training (37%). Main respondents' recommendations included conducting awareness campaigns and updating vaccination guidelines.

Conclusions: Healthcare workers in Tripoli displayed positive attitudes toward vaccination but demonstrated gaps in knowledge and practices, particularly regarding vaccine administration and contraindications. Addressing training gaps and enhancing community awareness campaigns could strengthen immunisation programme performance. These findings provide actionable evidence to guide national immunisation strategies in Libya and inform regional public health priorities.

Role and outputs: Principal Investigator. Zakaria wrote the study protocol, prepared and submitted the ethical approval application, and developed the questionnaire and XLSForm for Kobo Toolbox. He coordinated data collection and ensured compliance with informed consent procedures. He analysed the data and interpreted of results. He drafted the manuscript and submitted it to a peer-reviewed journal.

Supervisor(s): Zeinab Saleh

Status: Completed

4. Scientific communication

Conference presentations

- Elboukhari Z, Salah Z, Emahbes T, Mohamed R, Eltriki H, Sharif A. Waterborne diarrheal outbreak in a migrant residence centre, Tripoli, Libya, 2024. Abstract presented as poster presentation: European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE); 19-21 November 2025, Warsaw, Poland.

Publications and outputs

- Elboukhari Z, Salah Z, Emahbes T, Shnaish S. Understanding healthcare workers' knowledge, attitudes, and practices towards vaccination in Tripoli, Libya. Submitted to the Journal of Public Health in Africa in October 2025.

5. Teaching activities

Waterborne disease outbreak investigation – Libya case study, July 2024

On 4 July 2025, Zakaria organised a 3.5-hour training session on outbreak investigation principles. The session held at the National Centre for Disease Control (NCDC) in Tripoli was tailored to 22 public health professionals from units including Field Epidemiology, Rapid Response, PHEOC, Community Protection, Reference Laboratory, Research and Study, and Zoonotic Disease Administration.

European Centre for Disease Prevention and Control (ECDC)

Gustav den III:s Boulevard 40, 169 73 Solna, Sweden

Phone: +46 (0)8 58 60 10 00 - Fax: +46 (0)8 58 60 10 01

www.ecdc.europa.eu

Zakaria developed and delivered the training materials, which included a PowerPoint lecture on outbreak investigation principles, a case-study scenario of an amoebiasis outbreak in Ghadames, and an Excel-based line-list (228 simulated cases) for hands-on analysis. The session employed a blended approach: 30% lecture, 60% practical exercises, and 10% group discussion, emphasising active participation and intersectoral collaboration. Participants practiced defining case definitions, constructing epidemic curves, calculating attack rates, and formulating risk communication messages. Pre- and post-tests assessed knowledge gain, showing a clear improvement (average score increase from 6.14 to 9.41). Session evaluation indicated high satisfaction with content quality, trainer performance, and relevance to work.

6. Other activities

- **Head of Operations, NCDC–PHEOC (Jan 2024):** Led response to rising water levels in Zliten, including risk assessment, geo-mapping of affected areas, establishment of active syndromic surveillance, and dissemination of recommendations.
- **Risk Assessment Mission, Al Kufra (Apr 2024):** Team member in collaboration with WHO to assess migration flow following the arrival of large numbers of Sudanese refugee. Activities included health risk assessments, service access mapping, establishing focal points for communication, and rapid testing (malaria, HIV, Hep B & C) to establish a baseline for future reference.
- **Joint External Evaluation (JEE), with IHR Libya Focal Point (May 2024–Oct 2025):** Contributed as team member in the evaluation of Points of Entry and Human Resources. Supported preparation, reporting, and refinement of team findings. Currently serving on the facilitators' panel to receive WHO expert team (mission scheduled for Oct 2025).
- **Infectious Disease Notification List (July 2024):** Participated in finalisation of the national notifiable diseases list.
- **Expanded Programme on Immunization (EPI), NCDC (2024–2025):** Supported national vaccination administration. Served as team lead during supervisory evaluation visits with WHO to Al-Abrak municipality (May 2025), severely affected by Storm Daniel.
- **WHO Consultancy, Migrant Health (Jul 2025):** Conducted assessment of migrants' access to health services and health system burden in Libya. Tasks included desk review, key informant interviews, facility data collection, stakeholder validation workshop, and preparation of final report.
- **IOM Collaboration, PoE Mapping (Sep 2025–Nov 2025):** Served as evaluator for mapping and assessing IHR core capacities at Points of Entry across Libya.

7. MediPIET modules attended

- Introductory Course, three weeks, 25 September - 13 October 2023, Spetses, Greece, face-to-face.
- Study Protocol and Scientific Writing, 26-27 October, 07-08 November 2023, virtual.
- Project Review 2024, 26-30 August 2024, Lisbon, Portugal, face-to-face.
- One Health approaches in MediPIET countries, 3-7 June 2024, Belgrade, Serbia, virtual.
- Time Series Analysis (TSA), 9-13 December 2024, Bilthoven, Netherlands, face-to-face.
- Multivariable Analysis (MVA), 17-21 February 2025, Berlin, Germany, face-to-face.
- MediPIET Chemical, Biological, Radiological and Nuclear Awareness and Mitigation CBRN, 7-11 April 2025, Budva, Montenegro, face-to-face.
- Rapid Assessment and Survey Methods (RAS), five days, 9-13 June 2025, Athens, Greece, face-to-face.
- Project Review 2025, five days, Lisbon, 25-29 August 2025, Lisbon, Portugal, face-to-face.

8. Personal conclusions of fellow

Over the course of these two years, I experienced substantial personal and professional growth as a public health professional. The most striking aspect was the breadth of skills and knowledge I was able to acquire from supervisors, facilitators, and fellow colleagues. Balancing the demanding responsibilities of my role at NCDC with the structured requirements of the fellowship was both challenging and motivating. This experience pushed me to adapt, communicate effectively, and develop the ability to bridge the gap between the well-established mechanisms in Europe and the simpler, resource-limited methods used in Libya. Through applying and simplifying sound scientific methods to their core purposes, I learned that progress is possible even in constrained settings if approached collaboratively and with a mindset of 'let us learn and apply the best possible together'. I believe that my work during the fellowship, from outbreak investigations and vaccination assessments to migrant health evaluations and emergency response coordination, has created measurable change and perhaps a ripple effect that can extend beyond the fellowship itself. Above all, the programme has given me the confidence and tools to continue contributing to public health in Libya with a stronger, evidence-based approach.

9. Acknowledgements

I would like to express my gratitude to Dr Zeinab Saleh for supervision and mentorship, Pawel Stefanoff for scientific guidance, and colleagues from NCDC-Libya General Management and various departments for their collaboration throughout the fellowship.