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Correlation between meticillin-resistant *Staphylococcus aureus* prevalence and infection control initiatives within southern and eastern Mediterranean hospitals

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Summary The Mediterranean region has been identified as an area of hyper-endemicity for multi-resistant hospital pathogens. To better understand potential drivers behind this situation, we attempted to correlate already published meticillin-resistant *Staphylococcus aureus* (MRSA) data from 27 hospitals, participants in the Antibiotic Resistance Surveillance & Control in the Mediterranean Region (ARMed) project, with responses received from the same institutions to questionnaires which dealt with various aspects of infection control and antibiotic stewardship. No difference could be ascertained between high and low prevalence hospitals in terms

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of scores from replies to structured questions regarding infection control set-up, hand hygiene facilities and antibiotic stewardship practices. However, we did identify differences in terms of bed occupancy and isolation facilities. Hospitals reporting frequent episodes of overcrowding, particularly involving several departments, and which found regular difficulties sourcing isolation beds, had significantly higher MRSA proportions. This suggests that infrastructural deficits related to insufficient bed availability and compounded by inadequate isolation facilities could potentiate MRSA hyper-endemicity in south-eastern Mediterranean hospitals.

Introduction

The Mediterranean region has been identified as an area of hyper-endemicity for multi-resistant hospital pathogens.[1] This is clearly the case for meticillin-resistant *Staphylococcus aureus* (MRSA) within the European continent, where data from the European Antimicrobial Resistance Surveillance System (EARSS) indicate that almost all of the high prevalence countries border the Mediterranean sea.[2] In the past few years, information has also become available from the southern and eastern part of this region through the Antibiotic Resistance Surveillance & Control in the Mediterranean Region (ARMed) project [www.slh.gov.mt/armed].[3] Over a four-year period, this study documented the prevalence of antibiotic resistance in several key pathogens, and attempted to investigate potential drivers such as antibiotic consumption and infection control practices.

Our group has already published data on the prevalence of MRSA in this region.[4] The median MRSA proportions in blood culture isolates from the participating hospitals was 39% whereas, at country level, >50% of the isolates from Jordan, Egypt, Cyprus and Malta were meticillin resistant. At the same time, structured questionnaires looking at various aspects of infection control and antibiotic stewardship practices in collaborating hospitals identified limited development of infection control programmes, challenges from overcrowding and insufficient bed capacity, difficulties to isolate due to lack of available isolation beds, problems in achieving effective hand hygiene, as well as limited initiatives for improved antibiotic use in the hospitals surveyed.[5,6] This report examines correlatations between the data of the two studies and identifies infection control factors that were associated consistently with hospitals reporting higher MRSA bacteraemia proportions.

Methods

All hospitals that had provided complete questionnaire responses as well as consistent resistance data for *S. aureus* were identified initially and the overall meticillin resistance proportion calculated for each hospital. Individual responses to the infection control questionnaires were also tabulated. A focus group was formed from a number of project leaders and collaborators who selected the questionnaire replies that were deemed to offer greatest insight to practices within the participating hospitals and which, in their opinion, could potentially impact on MRSA epidemiology. After discussion, responses were grouped into four major areas (Table I):

1. Development of infection control infrastructure, personnel and training.
2. Ability to undertake isolation and /or challenges from overcrowding.
3. Compliance of staff in the performance of effective hand hygiene.
4. Good antimicrobial stewardship practices.

Each component was then graded as to its perceived relevance towards development and dissemination of resistance in healthcare settings by the members of the focus group and given a resultant score. Points could be either positive or negative, depending on whether it was likely to improve or reduce the prevention or control of healthcare-acquired infections. The highest scores were allocated where the focus group felt that a factor had a substantial direct impact on resistance epidemiology. In instances where a question could have various levels of response, a differential grading scale was adopted. As an example, in the case of isolation facilities, cohorting of known positive patients without dedicated nursing staff was regarded as