Effective Sources of Food Borne Illness in Iranian Hospitalized Patients: Review Article

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Antimicrobial resistance is one of the significant problems worldwide leads to curative failure of therapy and it has been a threat to the patient’s safety not only in developing countries but also in developed countries [3,14,16,35,21-23]. Therefore, awareness of the local prevalence of pathogens and their antimicrobial sensitivity patterns is essential for clinicians. Establishing surveillance systems integrate clinical and laboratory data and by it the necessary data can be captured and strengths of both data sets can be combined. There is evidence that the wiser use of antimicrobials may reduce the rate of resistance emerges [4,5,19,20,42,45]. Thus information from surveillance of antimicrobial resistance and data on the use of antimicrobials provides a powerful tool for the control of resistance. The aim of antimicrobial resistance surveillance is to provide information necessary to obtain an approach to the management of communicable diseases that diminishes morbidity and mortality[24,25]. The main applications of surveillance information are to optimize the use of antimicrobials and assist in the prevention and control of antimicrobial resistance at the local, regional and national levels [42,45,46].

Multidrug-resistant organisms (MDROs), including methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE) and certain Gram-negative bacilli (GNB) have important infection control implications that either have not been addressed or received only limited consideration in previous isolation guidelines. Increasing experience with these organisms is improving understanding of the routes of transmission and effective preventive measures. For epidemiologic purposes, MDROs are defined as microorganisms, predominantly bacteria, that are resistant to one or more classes of antimicrobial agents . Although the names of certain MDROs describe resistance to only one agent (e.g., MRSA, VRE), these pathogens are frequently resistant to most available antimicrobial agents . These highly resistant organisms deserve special attention in healthcare facilities [41]. In addition to MRSA and VRE, certain GNB, including those producing extended spectrum beta-lactamases (ESBLs) and others that are resistant to multiple classes of antimicrobial agents, are of particular concern. In addition to Escherichia coli and Klebsiella pneumoniae, these

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Discussion:

Study and comparing of ESBLs percentage showed that frequency of occurrence of ESBLs in E. coli and K. pneumoniae were higher in hospitalized patients in comparison to non hospitalized patients, for example in some study in Iran prevalence of ESBL in isolated E. coli and K. pneumoniae from hospitalized and non hospitalized patients was 72.22%, 23.73% and 83.33% and 0%, respectively [11-16].

The rapid spread of ESBL-producing bacteria worldwide indicated needing of a continuous monitoring systems and effective infection control measures [4,35,42]. Comprehensive epidemiologic data and characterization of ESBL-producing isolates among hospitalized and non hospitalized in Iran are still rarely documented and previous studies failed in extend number of patients, long-term study and comprehensive epidemiologic data despite of their useful content leading to a global view on ESBL producing bacteria in Iran. For example, [1] determine the prevalence of extended spectrum beta-lactamase (ESBL) producing E. coli in one 900-bed general teaching hospital showed 56% (n=140) of E. coli isolates produced ESBLs from 3 university hospitals in Tehran during six months. Therefore, for first time we (Mobasherizaded and et al) launched a prospective surveillance study of laboratory based antimicrobial resistance (Antimicrobial Resistance
Surveillance System) in Isfahan province, Iran. In this surveillance study, the prevalence of ESBL producing E. coli in hospitalized and non-hospitalized infections has been studied during three years (2008 to 2011) and WHONET software as an analysis program helping in forming hospital drug policy was used. (This WHONET is free Windows-based database software developed for the management and analysis of microbiology laboratory data with a special focus on the analysis of antimicrobial susceptibility test results). The prevalence of ESBL-producing E. coli under antimicrobial resistance surveillance system has been studied in several countries [5,32,37,39,40,43,45,46].

Establish systems for monitoring antimicrobial resistance in hospitals and the community and link these findings to resistance and disease surveillance data are fundamental to developing treatment guidelines accurately and to assessing the effectiveness of interventions appropriately. For first time launched (Mobasheirizaded and et al) a prospective Antimicrobial Resistance Surveillance System in Iran. Present result showed very high prevalence of ESBL producing E.coli and K. pneumoniae in Iran province that alarm an emerging public-health concern, showed emergence need for developing a treatment guideline for antibiotic consumption. Continued surveillance will provide an important function for succeed in the efforts of infection control programs in future and it is a critical step for controlling of the growing worldwide threat of antimicrobial drug resistance [9,10].

Nosocomial infections occur worldwide and affect both developed and resource-poor countries. Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients. They are a significant burden both for the patient and for public health [6,13,25]. A prevalence survey conducted under the auspices of WHO in 55 hospitals of 14 countries representing 4 WHO Regions (Europe, Eastern Mediterranean, South-East Asia and Western Pacific) showed an average of 8.7% of hospital patients had nosocomial infections [6]. At any time, over 1.4 million people worldwide suffer from infectious complications acquired in hospital. The highest frequencies of nosocomial infections were reported from hospitals in the Eastern Mediterranean and South-East Asia Regions (11.8 and 10.0% respectively), with a prevalence of 7.7 and 9.0% respectively in the European and Western Pacific Regions [5,6,25,26,37,46].

The health-care environment contains a diverse population of microorganisms. Microorganisms present in great numbers in moist, organic environments, but some also can persist under dry conditions. Environmental source or means of transmission of infectious agents, the presence of the pathogen does not establish its causal role; its transmission from source to host could be through indirect means, e.g., via hand transferability [5,22-24,26,46]. The surface would be considered as one of a number of potential reservoirs for the pathogen, but not the de facto source of exposure. An understanding of how infection occurs after exposure, based on the principles of the chain of infection is also important in evaluating the contribution of the environment to healthcare-associated disease [44]. All of the components of the chain must be operational for infection to occur:

1. Adequate number of pathogenic organisms (dose); 2. Pathogenic organisms of sufficient virulence; 3. A susceptible host; 4. An appropriate mode of transmission or transferal of the organism in sufficient number from source to host; 5. The correct portal of entry into the host [44]. Although microbiologically contaminated surfaces can be served as reservoirs of potential pathogens, these surfaces generally are not directly associated with transmission of infections to either staff or patients [44].

The transferral of microorganisms from environmental surfaces to patients is largely via hand contact with the surface [44]. S. aureus, Escherichia coli and spore forming Bacteria are the most bacterium causing foodborne diseases in hospital and community.

S. aureus is the most common gram-positive bacterium causing NIs [29,45]. Its frequency among all pathogens in NIs varies between 11.1 and 17.2% (40; 42; 50).

Methicillin resistance in S. aureus (MRSA) is increasing worldwide [43], leading not only to NIs but recently also to community-acquired infection. Colonization of health care workers’ hands with S. aureus has been described to range between 10.5 to 78.3% . Up to 24,000,000 cells had been found per hand [2]. The colonization rate with S. aureus was higher among doctors (36%) than among nurses (18%), as was the bacterial density of S. aureus on the hands (21 and 5%, respectively, with more than 1,000 CFU per hand). The carrier was be up to 28% if the health care worker contacts patients with an atopic dermatitis which was colonized by S. aureus [51]. MRSA has been isolated from the hands of up to 16.9% of health care workers. VRE can be found on the hands of up to 41% of health care workers. Hand carriage of pathogens such as S. aureus, MRSA, or S. epidermidis has repeatedly been associated with different types of NI [11].

The analysis of outbreaks revealed that dermatitis on the hands of health care workers was a risk factor for colonization or for inadequate hand hygiene, resulting in various types of NI. Transmissibility of VRE has also been demonstrated. The hands and gloves of 44 health care workers were sampled after care of VRE-positive patients. Gloves were VRE positive for 17 of 44 healthcare workers, and hands were positive for 5 of 44, even though they had worn gloves [47]. One health care worker was even VRE positive on the hands although the culture from the glove was negative [47].

S. aureus can survive on hands for at least 150 min; VRE survives on hands or gloves for up to 60 min. On inanimate surfaces, S. aureus and MRSA may survive for 7 months, with wild strains surviving longer than...
laboratory strains. VRE may survive on surfaces for 4 months. The long survival on surfaces, together with the relatively short survival on hands, suggests that contaminated surfaces may well be the source of transient colonization despite negative hand cultures. *Escherichia coli* is the most common gram-negative bacterium, causing mainly NIs [27]. Overall, gram-negative bacteria are found in up to 64% of all NIs. Colonization rates of gram-negative bacteria on the hands of health care workers have been described as ranging from 21 to 86.1%, with the highest rate being found in ICUs. The number of gram-negative bacteria per hand may be as large as 13,000,000 cells [2]. The colonization may be long-lasting [28]. Even in nursing homes, a rate of 76% has been described for nurses hands [52]. Colonization with gram-negative bacteria is influenced by various factors. For example, it is higher before patient contact than after the work shift [9]. Hands with artificial fingernails harbor gram-negative bacteria more often than those without [10]. Higher colonization rates with gram-negative bacteria also occur during periods of higher ambient temperature and high air humidity [31].

Transient hand carriage of various gram-negative bacterial species has quite often been suspected to be responsible for cross-transmission during outbreaks resulting in various types of NI [7]. Most gram-negative bacteria survive on the hands for 1 h or more. Survival on inanimate surfaces has been reported to be different for the different gram-negative species, with most of them surviving for many months. In general, gram-negative bacteria survive for longer on inanimate surfaces than on human skin. The main spore-forming bacterium causing NIs is *Clostridium difficile*. It is estimated that between 15% and 55% of all cases of nosocomial antibiotic-associated diarrhea are caused by *C. difficile* [3,34]. Patients with diarrhea caused by *C. difficile* have on average 3.6 additional hospital days attributable to the NI. The overall mortality is 15% [35]. Extraintestinal manifestations are very uncommon (1%). Patients can be contaminated from, for instance, the hands of hospital personnel and from inanimate surfaces [3]. In one study, the hands of 59% of 35 health care workers were *C. difficile* positive after direct contact with culture-positive patients. Colonization was found mainly in the subungual area (43%), on the fingertips (37%), on the palm (37%), and under rings (20%) [32]. In another study, 14% of 73 health care worker s were culture positive for *C. difficile* on their hands. The presence of *C. difficile* on the hands correlated with the density of environmental contamination [41]. During a third outbreak, caused by *Bacillus cereus* in a neonatal ICU, 11 (37%) of 30 fingerprints from health care workers were positive for *Bacillus spp.* [48]. Transmission of *C. difficile* in an endemic setting on a general medical ward has been shown to occur in 21% of patients, with 37% of them suffering from diarrhea. Another spore-forming bacterium has been described as well: *B. cereus* was transmitted to the umbilicus in 49% of newborns on a maternity ward; the hands of 15% of the health care workers were found to be culture positive [4]. Vegetative cells of *C. difficile* can survive for at least 24 h on inanimate surfaces, and spores survive for up to 5 months.

According role of hands of staff and hospital surfaces in nosocomial infection and increase of antibiotic resistance nosocomial infection in Iranian hospitalized patients, the subject of this study was survey effective sources of food borne illness in hospitalized patients in Iranian hospital.

**RESULTS AND DISCUSSION**

About important staff hands and hospital surfaces in transmission Food borne Illness Bacteria in hospital in articles, there is consensus that control Bacterial population in these sources, lead to control these Bacteria in hospital [5,13,44].

According result previous study in Iranian hospital, *Staphylococcus* *sp*. 101 consist of isolated bacteria from hospital surfaces and 28 consist of isolated bacteria from hands of staff and according to Acidimetric test results respectively 73 species of *Staphylococcus* isolated from hospital surfaces and 19 species of *Staphylococcus* isolated from hands of staff was resistance to beta lactame antibiotics [15-17,20,21].

According previous study 83.33% of *Staphylococcus* spp. isolated from nosocomial infection in Iran was resistant to beta lactame antibiotics [14]. According result another study in Iran, 61.9% of bacteria isolated from biotic condition in hospital was resistance to beta lactame antibiotics, respectively was in *Staphylococcus* spp., *Bacillus* spp. and *Enterobacteriaceae* 71%, 64.72% and 50%, According another study in Iran 77.94% of Bacteria isolated from abiotic condition in hospital was resistant to beta lactame antibiotics, respectively in *Staphylococcus* spp., *Bacillus* spp. and *Enterobacteriaceae* 82.7%, 68.4% and 80.35% [15,16,17,20].

Nosocomial infections (NIs) remain a major global concern. Overall national prevalence rates have been described as ranging between 3.5 and 9.9% [26]. They lead to additional days of treatment, increase the risk of death and increase treatment costs. Staff hands and hospital surfaces have important role in NIs [1,8,12,36]. Bacteria on hospital surfaces have low potential to spread. Staff hands have very contact with hospital surfaces and are more sources to transmission Bacteria into hospital. Improving staff hand and hospital surfaces hygiene had been considered the most important tool in control of transmission Food borne Illness Bacteria [5,13,18,19,44].

**Conclusion:**
The importance of hands in the transmission of hospital infections has been well demonstrated and can be minimized with appropriate hand hygiene. Compliance with hand washing, however, is frequently suboptimal. This is due to a variety of reasons, including: lack of appropriate accessible equipment, high staff-to-patient ratios, allergies to hand washing products, insufficient knowledge of staff about risks and procedures, too long a duration recommended for washing, and the time required [5,13,44]. To minimize the transmission of microorganisms from equipment and the environment, adequate methods for cleaning, disinfecting and sterilizing must be in place. Written policies and procedures which are updated on a regular basis must be developed for each facility [5,13,44].

The director of food services must be knowledgeable in food safety, staff training, storage and preparation of foodstuffs, job analysis, and use of equipment. The head of catering services is responsible for: 1-defining the criteria for the purchase of foodstuffs, equipment use, and cleaning procedures to maintain a high level of food safety 2-ensuring that the equipment used and all working and storage areas are kept clean 3-issuing written policies and instructions for hand washing, clothing, staff responsibilities and daily disinfection duties 4-ensuring that the methods used for storing, preparing and distributing food will avoid contamination by microorganisms 5-issuing written instructions for the cleaning of dishes after use, including special considerations for infected or isolated patients where appropriate 6-ensuring appropriate handling and disposal of wastes 7-establishing programmes for training staff in food preparation, cleanliness, and food safety 8-establishing a Hazard Analysis of Critical Control Points (HACCP) programme, if required [5,13,44].

Approximately one third of nosocomial infections are preventable. Cleaning is the necessary first step of any sterilization or disinfection process. Cleaning is removing organic matter, salts, and visible soils, all of which interfere with microbial inactivation [5,13,44]. Hand washing frequently is called the single most important measure to reduce the risks of transmitting microorganisms from one person to another or from one site to another on the same patient. Although hand hygiene is important to minimize the impact of this transfer, cleaning and disinfecting environmental surfaces as appropriate is fundamental in reducing their potential contribution to the incidence of healthcare-associated infections [30,33,38,39,49].

REFERENCES


