MICROBIAL CONTAMINATION OF KITCHEN SPONGES IN UNIVERSITY STUDENT DORMITORIES

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Abstract: This study investigated the microbial quality and usage of kitchen sponges in student dormitories at the University of Sharjah, based on previous findings from studies conducted in the United States. Fifty kitchen sponges were collected along with a questionnaire on usage patterns and socio-demographic information. The sponges were analyzed immediately and after storage at room temperature (21 °C) for 3 and 10 days to assess changes in microbial populations. Microbiological analysis included mesophilic aerobic bacteria, coliforms, Enterobacteriaceae, yeasts, and molds. The most frequently isolated Enterobacteriaceae were *Enterobacter cloacae* and *Klebsiella oxytoca*, with all *E. cloacae* isolates showing resistance to several antibiotics. The study highlights that dormitory students often exhibit inadequate hygiene practices, leading to highly contaminated sponges capable of transferring pathogenic bacteria to food-contact surfaces.

Key words: Sponges, Kitchen, Cleaning, Dormitories, Storage, Enterobacteriaceae, Antibiotic resistance.

Background: Kitchen sponges represent a significant source of cross-contamination, as they are capable of transferring foodborne pathogens, infectious agents, and spoilage microorganisms to food-contact surfaces [1,2]. Previous studies have demonstrated that university students frequently exhibit inadequate food safety and hygiene practices, particularly in relation to the use and maintenance of kitchen cleaning tools [3-5].

Previous studies have reported that kitchen sponges are frequently contaminated with pathogenic bacteria. In the USA, 33% and 67% of sponges tested positive for *Escherichia coli* **and fecal coliforms, respectively [6], while 15.4% of household sponges were contaminated with** *Salmonella* **spp. [7]. Other studies have identified** *Campylobacter* **spp.,** *Enterobacter cloacae*, *Klebsiella* **spp.,** *Proteus* **spp.,** *Acinetobacter*, *Moraxella*, **and** *Staphylococcus* **spp. in domestic kitchen sponges [8,9]. High counts of aerobic mesophilic bacteria, coliforms, Enterobacteriaceae, yeasts, and molds are often reported due to poor sponge sanitation [4,7]. Coliforms, as**

indicators of hygiene, can accumulate in kitchens through inadequate disinfection, poor hygiene practices, raw product contamination, and cross-contamination [10,11].

Microbial contamination poses significant health, social, and economic risks [12], and the rise of antibiotic-resistant bacteria, particularly Enterobacteriaceae producing ESBLs, is a growing concern [13]. These multidrug-resistant strains are increasingly present not only in hospitals but also in community settings, limiting treatment options in case of infections [12].

University students often demonstrate inadequate food safety and hygiene practices, increasing their risk of foodborne illnesses [3-5]. This study aimed to investigate the microbial quality and usage of kitchen sponges in University of Sharjah dormitories, evaluate the effect of storage on sponge microbial populations, and identify Enterobacteriaceae isolates and determine their antibiotic resistance profiles.

Methods: Researchers conducted unannounced visits twice a week to female dormitories at two University of Sharjah locations between 8:00 a.m. and 12:00 p.m. to explain the study objectives and recruit participants. A total of 50 students consented to participate. One kitchen sponge was collected from each dormitory room (n = 50) using sterilized forceps, noting that sponges were shared in two-student rooms. Dormitory rooms were maintained at 21 °C, kitchens had no nearby windows, and sponges were stored on sinks without direct sunlight exposure. Each sponge was individually placed in sterile plastic bags and transported within 30 minutes in an ice box to the Nutrition and Food Laboratory (Research Institute for Medical and Health Sciences, University of Sharjah) for analysis. Additionally, all participants completed a two-part questionnaire covering socio-demographic characteristics and kitchen sponge usage. [14]

Kitchen sponges composed of polyester and polyurethane were coded and aseptically cut into three equal parts. One part was analyzed microbiologically within 1 hour, while the remaining parts were stored at ambient temperature (21 ± 1 °C, 59 ± 2% relative humidity) for 3 and 10 days. Sponge weight and water activity were measured at 0, 3, and 10 days. For microbiological analysis, sponge samples were homogenized in 0.1% peptone water, serially diluted, and plated on selective media to enumerate mesophilic aerobic bacteria, coliforms, Enterobacteriaceae, and yeasts and molds. Plates were incubated under standard conditions. Unused sponges served as negative controls. Representative Enterobacteriaceae isolates were identified using the VITEK 2 system, and their antibiotic susceptibility was assessed using a Gram-negative susceptibility card. Questionnaire data and microbiological results were

analyzed using SPSS software, applying descriptive statistics and one-way ANOVA with Tukey post-hoc tests, with significance set at $P < 0.05$. [14]

Results: Analysis of student responses indicated that kitchen sponges used for cleaning food-contact surfaces were frequently repurposed for other household tasks, including cleaning ovens (32%), sinks (26%), refrigerators (10%), and wiping floor spills (4%). Microbiological analysis revealed that the sponges harbored high levels of mesophilic aerobic bacteria (7.9 $\log_{10}/cm^3$), coliforms (7.2 $\log_{10}/cm^3$), Enterobacteriaceae (7.3 $\log_{10}/cm^3$), as well as yeasts and molds (7.0 $\log_{10}/cm^3$). Following storage of the sponges at room temperature (21 °C) for 3 and 10 days, reductions were observed in mesophilic aerobic bacteria (0.4 and 1.3 $\log_{10}/cm^3$), coliforms (0.7 and 1.4 $\log_{10}/cm^3$), Enterobacteriaceae (0.4 and 1.1 $\log_{10}/cm^3$), and yeasts and molds (0.6 and 1.3 $\log_{10}/cm^3$), respectively. The most commonly isolated Enterobacteriaceae species were *Enterobacter cloacae* (56%) and *Klebsiella oxytoca* (16%). Notably, all *E. cloacae* isolates exhibited resistance to amoxicillin, cefalotin, cefoxitin, and cefuroxime axetil. [14]

Conclution: In conclusion, female students residing in the University of Sharjah dormitories demonstrated limited knowledge of proper hygienic practices. Kitchen sponges, intended primarily for cleaning food-contact surfaces, were frequently used for other purposes and stored for extended periods. Storage at room temperature did not significantly reduce microbial loads. The sponges were colonized by potentially pathogenic bacteria, many of which exhibited antibiotic resistance. These findings highlight the need to reinforce good hygiene practices to minimize the risk of contaminating ready-to-eat foods, raw products, and the general kitchen environment. The study had limitations, including a small sample size and the inclusion of only female students, as the data collectors could not access male dormitories. Further research should involve larger, more diverse student populations across multiple universities.

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