FAECAL POLLUTION AND SEAWATER QUALITY OF RECREATIONAL BEACHES OF VLORA BAY, ALBANIA

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Abstract

A total of 5 sampling points along Vlora Bay beaches (Radhimë, Plazhi i Ri, Akademia e Marinës, Plazhi i Vjetër, Nartë) were selected and monitored during the period of Aprill 2015 to August 2015. Samples were evaluated for faecal coliforms (FC) and faecal streptococci (FS). Akademia e Marinës beach had the highest incidence of faecal indicators (FC and FS), respectively 80 % of samples, followed by Plazhi i Ri (60 % and 80 %), and Plazhi i Vjetër, (40 % and 40 %). Whereas, Radhima and Narta beach were in compliance with the Guidelines, as faecal indicators concentrations remaind well below the standards. High concentration of faecal indicators, in some of these beaches emphasizes the vitality of periodically monitoring of these areas in order to prevent bathers health risk. Also, preventive measures such as education campaigns to discourage the use of polluted recreational areas are important precautionary measures.

Përmbledhje

Qëllimi i këtij studimi ishte vlerësimi i cilësisë mikrobiologjike të disa prej plazheve kryesore të Gjirit të Vlorës. Gjatë periudhës Prill 2015 - Gusht 2015, pesë pika kampionimi u përzgjodhën dhe monitoruan në plazhet: Radhimë, Plazhi i Ri, Akademia e Marinës, Plazhi i Vjetër dhe Nartë. Mostrat u vlerësuan për koliformët fekal (FC) dhe streptokokët fekal (FS). Plazhi pranë Akademisë së Marinës kishte shpeshtinë më të lartë të indikatorëve fekal (FC dhe FS), përkatësisht 80 % të mostrave, e ndjekur prej Plazhit të Ri (60 % dhe 80 %) dhe Plazhi i Vjetër, (40 % dhe 40 %). Ndërsa, plazhi i Radhimës dhe Nartës ishin në përputhje me udhëzimet, pasi përqëndrimet e indikatorëve fekal qëndruan nën vlerat standarde. Përqëndrimet e larta të indikatorëve fekal, në disa prej këtyre plazheve thekson rëndësinë e monitorimeve të vazhdueshme të këtyre zonave me qëllim parandalimin e rreziqeve të shëndetit të pushuesve. Gjithashtu, masat parandaluese si fushatat edukuese për të dekurajuar përdorimin e zonave pushuese të ndotura janë masa paraprake të rëndësishme.

Key words: faecal indicators, Vlora Bay beaches, preventive measures.

Introduction

Most beaches and bathing areas are near cities. The dumping of urban and industrial waste into the sea, with their high level of pathogenic and other polluting agents, raises concern about its consequences for both health and ecology, Prieto *et al.* (2001). In addition, recreational waters may contain free-living pathogenic microorganisms, WHO (2003). Epidemiological studies have shown that swimmers in sewage-polluted seawater experience diseases that range from self-limiting gastrointestinal disturbances to severe and life-threatening infections. The disease incidence is dependent on several factors: the extent of water pollution, time and type of exposure, the immune status of users and other factors, Bartram & Rees (2000). The series of randomized epidemiological investigations, conducted in the United Kingdom, provide such data for gastroenteritis Kay *et al*. (1994), acute febrile respiratory illness (AFRI) and ear aliments associated with marine bathing Fleisher *et al*. (1996). For this reason, it is essential that these areas are periodically evaluated in regard to their level of microbial contamination.

Material and methods

Sample Collection

Water samples were collected from five beaches in Vlora Bay: Radhimë, Plazhi i Ri, Shkolla e Marinës, Plazhi i Vjetër, Plazhi i Nartës monthly (Tab. 1). Sampling was performed according to the World Health Organization criteria for recreational water quality. Sample collection lasted from Aprill to August 2015. Sterile bottles were used to collect water samples at chest level (1 m) at depth of 20 cm and the bottle was filled approximately 2/3, WHO (1995).

Table 1. Sampling location

Site	City/Address	Recognized spot	GPS locations	
			N	E
1	Radhimë	Royal Hotel	40º22’44’’	19º28’50.149’’
2	Vlorë	Plazhi i Ri	40º26’15.747”	19º29’41,599”
3	Vlorë	Akademia e Marinës	40º26’44,144”	19º29’49,631”
4	Vlorë	Plazhi i Vjetër,	40º27’57,061”	19º27’43,936”
5	Nartë	Karafili Resort	40º29’31.132’’	19º25’48.431’’

A membrane filter technique was used for the detection and identification of faecal coliforms and faecal streptococci according to the standard method for water and waste water, APHA (1999).

Results

All locations were evaluated using the European Community (EU) standards for faecal coliforms and faecal streptococci (ISO-9308-1, ISO-7899-2).

Faecal coliforms concentration during sampling period ranged from 2 to 1640 CFU/100 ml (Tab.2). The maximum value of 1640 CFU/100 ml was observed at site 3. Faecal streptococci concentration during sampling period ranged from 4 to 1500 CFU/100 ml. The maximum value of 1500 CFU/100 ml was also found at site 3. Faecal indicator concentrations (90th percentile) for the 5 collection sites are presented in Fig.1. During the sampling period 36 % of faecal coliform samples and 40 % of faecal streptococci samples were higher than guideline values.

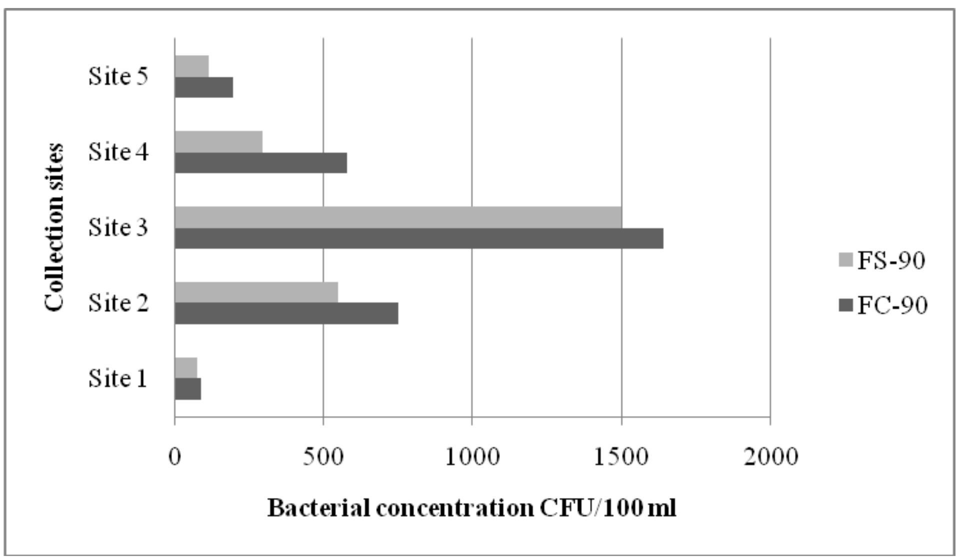

Figure 1. Faecal coliforms and faecal streptococci concentration at each collection site during the sampling period.

Table 2. Summary results of faecal coliforms and faecal streptococci (CFU/100ml), failure percentages when compared to EU standards, minimum, maximum, the range and median values of indicator bacteria at each collection site.

Location		% failure when compared to EU standards	Min value	Max value	The range	Median value
Site 1	FC	0	50	90	40	85
	FS	0	20	77	57	65
Site 2	FC	60	210	750	540	620
	FS	80	185	550	365	450
Site 3	FC	80	200	1640	1440	882
	FS	80	132	1500	1368	570
Site 4	FC	40	35	580	545	196
	FS	40	17	295	278	164
Site 5	FC	0	2	197	195	30
	FS	0	4	116	112	25

Discussion

Waterborne gastroenteritis outbreaks in swimmers occurs more often in summer, when the number of tourists at beach resort areas is higher and consequently there is an increase of sewage discharge to the seawater, Sato *et al*. (2005). Also, rainfall events can have a significant effect on indicator densities in recreational waters because of urban runoff, WHO (1999). A cause-effect relationship between faecal pollution and these outbreaks is well established and the symptom rates were found to be higher in children, Prüss (1998).

The given table data (Tab. 2) shows that based on faecal coliform and faecal streptococci densities (620 and 450 CFU/100ml respectively) the pollution was significant at site 2, very severe at site 3 (882 and 570 CFU/100ml), while site 1 and 5 concentrations were in compliance with the standards. In contrast to 2014 observations, Bofe *et al*. (2015) faecal indicator densities at site 4 were slightly higher than standards. When faecal coliforms and faecal streptococci results were compared to the EU standards, a higher compliance failure percentage was associated with faecal streptococci rather than faecal coliforms. One explanation for the higher rate of enterococci standard failures is that enterococci survive longer in the marine environment than TC or FC, Hanes & Fragala (1967).

It was observed that the beach at site 3 had the highest compliance failure percentage of faecal coliforms and faecal streptococci (80 % and 80 % respectively). These results indicate that this area is highly polluted and beyond any evident parameter and tremendous source of infections. According to the Institute of Public Health, IPH (2011) this is due to the large number of wastewater outfalls in the area, discharged without prior treatment. This was followed by site 2 (60 % and 80 %), which also has a large number of wastewater outfalls and site 4 (40 % and 40 %).

Based on the results (Fig. 1, Tab. 2), site 3 values were much higher than standards, which means that this area is highly polluted and has a poor quality. Site 2 and 3 pollution also was significant and not sufficient for recreation, while site 1 and 5 concentrations were in compliance with the Guidelines, which makes these areas suitable for recreation (WHO, 2003; Directive 2006/7/EC). In comparison to 2014 values Bofe *et al*. (2015), indicator densities for 2015 were much higher. Routine monitoring should be undertaken to determine if a beach's classification status changes over time. Also, advising local residents and tourist not to bathe in the impacted zone of the intermittent discharge for a given period is an important precautionary measure WHO (1999).

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