International Journal of Healthcare and Medical Sciences
ISSN(e): 2414-2999, ISSN(p): 2415-5233
Vol. 4, Issue. 1, pp: 1-10, 2018
URL: http://arpgweb.com/?ic=journal&journal=13&info=aims

Academic Research Publishing Group

Original Research Open Access

Relation between Quantity of Disinfectant and Antiseptics Used and Appearance of Intra-Hospital Infections in the Region of Eastern Macedonia

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Abstract

It is well known that the type and quantity of used disinfectant and the disinfection procedures is directly related to the effects of their use. The aim of this study was to review of the use of antiseptics and disinfectants in the region of Eastern Macedonia over five years period. The data were collected from hospitals in the region of eastern Macedonia (Strumica, Veles, Stip and Kavadarci). The results of microbiological testing conducted by the public health institutes in the cities were also collected and used knowing that the routine testing period for microbiological controls in hospitals was 15 days. The results indicated that the number of conditionally pathogenic bacteria is reduced starting from 2011. The reduction of the quantity of disinfectant used is also noted from 2011. The results obtained in all hospitals examined show similar situation in the region of eastern Macedonia. We will present the results obtained from Clinical Centre - Stip as the center of this region. The amount of disinfectants and antiseptics consumed comparing with the microbiological data indicates their rational utilization starting from 2011. Use of disinfectants according to the standardized procedures established by the IHI times allows current daily care. The knowledge about the current situation permits the staff to take proper precautions. It is pointed out the role of IHI times in the hospitals, as well as the role of hospital pharmacists.

Keywords: Antiseptics; Disinfectants; Nosocomial infections.

1. Introduction

Nosocomial infections represent worry in great proportions for both staff and patients. Therefore, they give great emphasis on proper prevention which includes primarily the optimal use of disinfectants and antiseptics, and regular microbiological testing and controls. Antiseptics and disinfectants are widely used in hospitals and other medical facilities in different topical application and surfaces. A wide variety of active chemical agents (biocides) are applied over hundreds of years and represent alcohols, phenols, iodine and chlorine compounds. Most of these active substances show a broad spectrum of antimicrobial activity. In general, biocides have a broader spectrum of action than antibiotics. While antibiotics tend to target specific intracellular targets, biocides have different, multiple goals. The widespread use of these products raises doubts among many scientists and researchers to the development of antibiotic resistance, especially cross-resistance with the question whether resistance to antibiotics is caused by the use of antiseptics and disinfectants [1].

Mechanical cleaning before application of disinfectants is essential. Mechanisms of antibacterial disinfectants are summarized in several large critical reports worldwide. For example, alcohols show rapid action and broad spectrum of antimicrobial activity through denaturation of proteins, but do not act sporicidal. Aldehydes act by linking the amino groups of proteins, RNA and DNA. Oxidizing agents such as peroxides and halogens oxidize proteins thiol groups while surface active agents mainly act on the cytoplasmic membrane of the bacterial cell or plasma membrane of the yeasts. Phenols generally destroy the membrane.

For the use of biocides as chemicals is important to note that many of these biocides can be used independently or in combination with various other products that differ significantly in their activity. Antimicrobial activity may be influenced by many factors that can arise from the formulation, the synergistic activity, temperature, dilution and evaporation. Biocide is a general term used to describe a chemical agent, usually with a broad spectrum of activity, which inactivates microorganisms [2].

The nature and composition of the surfaces vary from one cell to another. But external factors or environmental factors can also affect the activity of antiseptics and disinfectants. The interaction with the bacterial cell surface can have a significant impact on the sustainability of the effect of the used chemicals, but insignificant stake is the fact that most antimicrobial agents act intracellular. The interior of the bacterial cell can thus have a significant impact on the overall durability of the bacterial cell or a different sensitivity to disinfectants and antiseptics, which is quite

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disappointing how little, is known. However, the potentiating of the action of certain disinfectants and antiseptics can be achieved by using different additives that significantly increase their potency.

1.1. Hospital-Acquired Infection (Nosocomial Infection)

A great number of studies around the world show and prove that hospital infections are a major cause of morbidity and mortality. High frequency of hospital infections is evidence of poor quality of health services and lead to unforeseen and unavoidable expenses. Many factors contribute to the incidence of hospital infections: hospitalized patients are often immuno-compromised. Hospital environment can facilitate the transmission of microorganisms among patients. The intensive use of antibiotics promotes the same resistant. Advances in the prevention of hospital infections is steadily increasing, and studies of the proper application and use of disinfectants, depending on their purpose and structure are constantly emerging [3].

The incidence of nosocomial hospital infections is still conducted in 1966 a study on the occurrence of infection caused by the Staphylococcus Aureus. The research has been done on different types of staphylococci responsible for the occurrence of cross infections in large hospitals between 1961 and 1966. Research has shown that infections are caused by three different types of staphylococcal to later identify and prove new species resistant to antibiotics. Two main groups of staphylococci were isolated species responsible for most cases of cross-infection in two hospitals. Species resistant to antibiotics are proven epidemiological types. It was proved that the typical group which causes infection is the main cause of infections in patients with open wounds and surgical areas with skin ulceration. The correlation was established between species resistant to antibiotics and similar vines of the two different types of bacteria. This research has provided result in increased guidance for improving the control of the occurrence of infections in hospitals and taking appropriate measures to prevent further spread.

National surveillance for infection control departments for coronary artery bypass grafting in Norway started operating in 2005. A study designed to measure and establish baseline incidence of the occurrence of infections in these departments, was conducted to describe the characteristics of patients, procedures and to identify possible risks of infection [4].

Protection and prevention of nosocomial infections as patients and staff brings important for every healthcare institution. Study on integrated mechanism for protection of patients was conducted during 2001 and explains all procedures, methods, protocols and aspects for better patient care and also includes protection against hospital infections. The same study develops system with integrated mechanism, a scheme for patient protection and infection control staff deals with four main issues

- What are the requirements for the control of infection in terms of performance requirements of the patients?
- What are the best ways to achieve these results?
- Who should be responsible for the results?
- Are there guidelines based on evidence that should be incorporated into protocols for protection [5]?

In order to comprehensively monitoring hospital infections in health care, patients are asked to monitor the studies about the point of prevalence of hospital infections. Monitoring of point prevalence was first established in Canada in University Hospital to establish baseline data about the occurrence of hospital acquired infections. This approach attempts to overcome the multitude of barriers, to practice universal surveillance potential and to achieve quantitative estimate of the number of hospital infections that occur. The study indicates that a reasonable alternative to this method is the development of a method that will rely on the concentrated control of microbial cultures [6].

A 2008 study suggests very few published reports on key focus of hospital teams of hospital infection control. Evidence from research suggests a multidisciplinary team based at the hospital, which should have a strategic approach and commitment to control hospital infections in all clinical areas. The structure and operation of teams includes supervision and differs from hospital to hospital from clinic to clinic depending on their needs. High quality and efficiency are crucial to reduce the risk of nosocomial infections, and as a result, and reduce mortality and morbidity in hospitals [7].

The basic tool of a study indicates that the data collection is necessary and to be used in order to advance a sweeping operation to improve the performance of a health institution. Teams of professionals constantly have access to all data for the possible occurrence of hospital infections. By simply collecting, collating and analysing all available data can reach effective conclusions. A simple description of the data can lead to many important facts that will be helpful in providing better protection and guidance on the specific procedures for protection. The study indicates that the professionals involved in the protection against infection should primary be aware of teams

- What data on the occurrence of hospital infections are routinely available daily
- Is this sufficient data can be gathered to describe the infection occurred during testing and epidemiological research
- How effective is the data used
- Is different, not daily presentation of the data will have a different effect
- What are the key priorities for the control of hospital infections in a healthcare institution and which data, methods and means of presenting the data would be best to improve the control of hospital infections? [8].

The literature provides many examples and explanations for microbial resistance to disinfectants. This can be proved either by laboratory experiments using elevated levels of biocides to choose the most appropriate, depending on the bacterial population or by examining biocidal solutions the presence of resistant microbial strains. Gram-negative bacilli are the most common isolates from this type of evaluation biocidal activity. This may be due to a combination of factors including changes in the permeability of the outer membrane which in turn is due to the change in the diameter of the pores [9].

Most disinfectants and antiseptics used in hospitals are prepared as solutions in hospital pharmacies from where they are distributed to all hospital departments. Research shows that contamination is possible during their manufacture. The level of contamination of some bacterial species ranges from 102 to 108 bacterial colonies formed per millilitre disinfectant / antiseptic to the possibility of achieving the infectious dose at the site of application. Epidemiological reports indicate many hospitals which often use contaminated disinfectants and antiseptics applied directly to the skin of patients, and are often used for decontaminations of instruments and diagnostic devices for treatment of patients. The data suggests many resistant bacteria isolated from disinfectants and antiseptics [10].

2. Goals

The aim of this study was to review of the use of antiseptics and disinfectants in the region of Eastern Macedonia over five years period.

The data were collected from hospitals in the region of eastern Macedonia (Strumica, Veles, Stip and Kavadarci). The results of microbiological testing conducted by the public health institutes in the cities were also collected and used knowing that the routine testing period for microbiological controls in hospitals was 15 days.

The results obtained in all hospitals examined show similar situation in the region of eastern Macedonia. We present the results obtained from Clinical Centre - Stip as the center of this region. The purpose is to show the connection between the quantity of disinfectants and antiseptics used in the Clinical Centre - Stip for five years, from 2007 to 2011 and the possible occurrence of hospital infections.

3. Materials and Methods

The data used for antiseptics and disinfectants are derived from

• Annual Evidence List of Clinical Centre - Stip. They are processed separately for each ward.

• Annual reports of the Centre for Public Health Stip - Epidemiologic Service.

The statistical analysis of the data analysed is the use of disinfectants and antiseptics annually each ward separately in Clinical Centre - Stip compared with the results of the microbiological analysis carried out in the Centre for Public Health - Stip. It is estimated the possible occurrence of hospital infections over a period of five years. The processed data provide the following results.

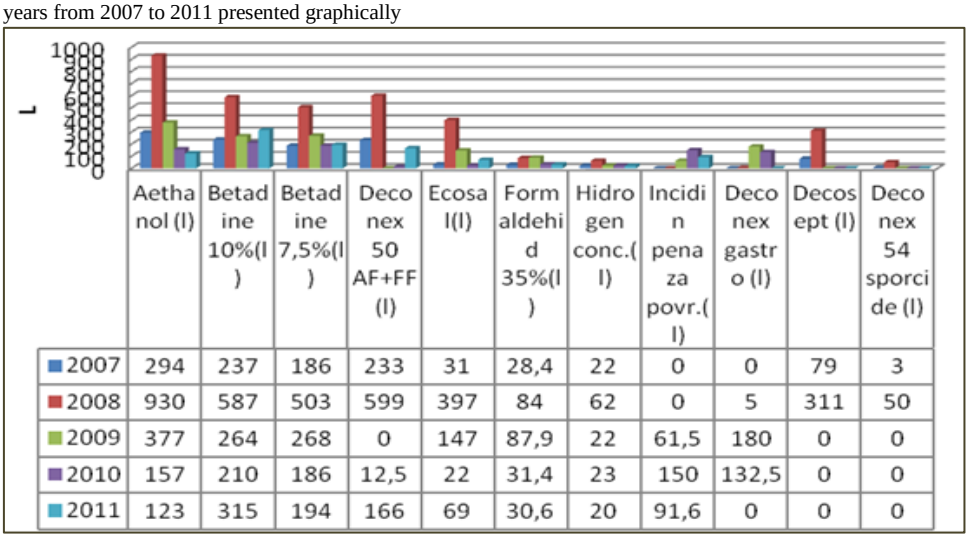
4. Results

The total amounts of the most commonly used antiseptics and disinfect ants of all departments in the Clinical Hospital - Stip in 2007 and 2011 is shown in Table 1.

Table -1. Total amount (in litres) of commonly used antiseptics and disinfectants of all departments in the Clinical Hospital - Stip in 2007 to 2011

	acidi bo	aethan	betad	betadir	decone	ecosa	forma	hydro	medica	incicin	decone	formal	hidrex	jodop	sekuse	decos	suma D4	izosar	decone
2007	17	294	237	186	233	31	28,4	22	600	0	0	1025	0	0,5	0	79	0	6,6	3
2008	32	930	587	503	599	397	84	62	390	0	5	1650	0,5	30	0	311	0	42	50
2009	22	377	264	268	0	147	87,9	22	16800	61,5	180	840	18	0	3	0	0	0	0
2010	21	157	210	186	12,5	22	31,4	23	10800	150	132,5	0	38,5	0	4,5	0	5910	0	0
2011	13	123	315	194	166	69	30,6	20	300	91,6	0	0	0	0,5	9	0	13020	0	0
total	105	1881	1613	1337	1010,5	666	262,3	149	28890	303,1	317,5	3515	57	31	16,5	390	18930	48,6	53

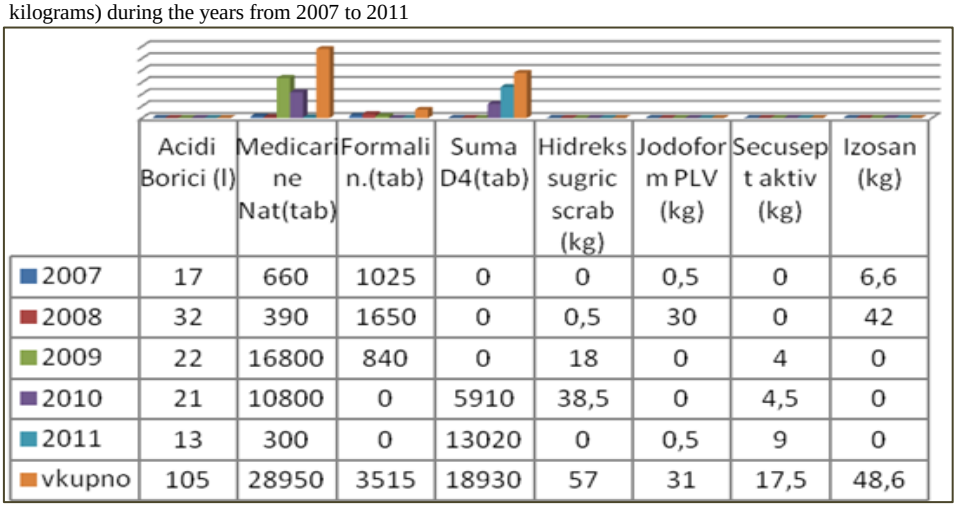
Figure-1. Consumption of commonly used antiseptics and disinfectants in liquid form (in litres) during the years from 2007 to 2011 presented graphically



	Aethanol (l)	Betadine 10%(l)	Betadine 7,5%(l)	Deconex 50 AF+FF (l)	Ecosal(l)	Formaldehid 35%(l)	Hidrogen conc.(l)	Incidin penaza povr.(l)	Deconex gastro (l)	Decosept (l)	Deconex 54 sporocide (l)
2007	294	237	186	233	31	28,4	22	0	0	79	3
2008	930	587	503	599	397	84	62	0	5	311	50
2009	377	264	268	0	147	87,9	22	61,5	180	0	0
2010	157	210	186	12,5	22	31,4	23	150	132,5	0	0
2011	123	315	194	166	69	30,6	20	91,6	0	0	0

In the period from 2007 to 2011 used antiseptics and disinfectants in liquid form, in 2007 spent the greatest amount of Ethanol (294 L), and the smallest amount Deconex 54 sporocide (3 L). In 2008 spent the greatest amount of Ethanol (930 L), and the smallest amount Deconex gastro (5 L). In 2009 spent major amounts of Ethanol (377 L), and the smallest amount Hydrogen conc. (22 L). 2010 spent major amounts of Betadine 10% (210 L), and the smallest amount Deconex 50 AF + FF (12.5 L). In 2011 spent major amounts of Betadine 10% (315 L), and the smallest amount Boric acid (13 L).

Figure-2. Consumption of commonly used antiseptics and disinfectants in solid form (in number of tablets and kilograms) during the years from 2007 to 2011

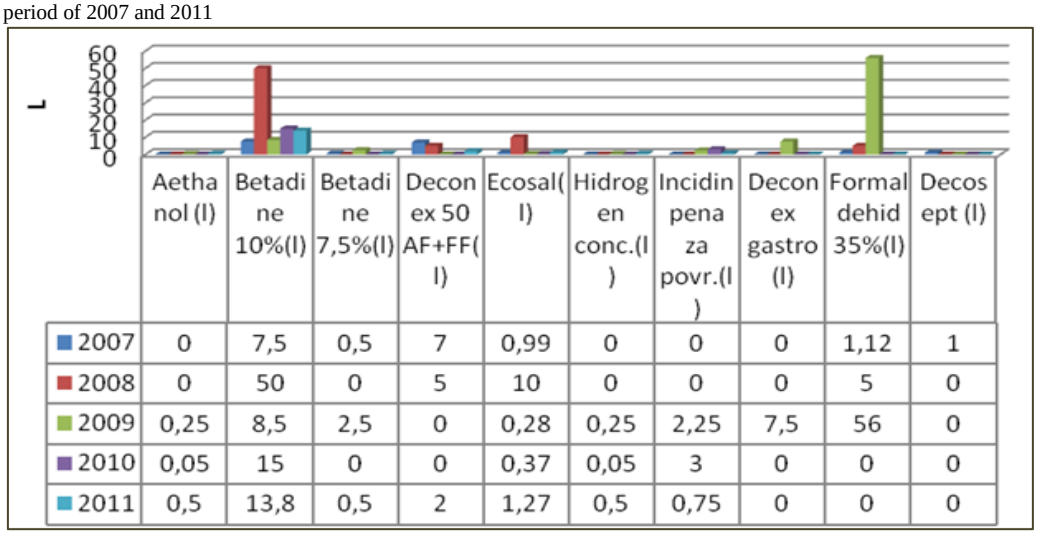


	Acidi Borici (l)	Medicarine Nat(tab)	Formalin.(tab)	Suma D4(tab)	Hidreksugric scrab (kg)	Jodoform PLV (kg)	Secusept aktiv (kg)	Izosan (kg)
2007	17	660	1025	0	0	0,5	0	6,6
2008	32	390	1650	0	0,5	30	0	42
2009	22	16800	840	0	18	0	4	0
2010	21	10800	0	5910	38,5	0	4,5	0
2011	13	300	0	13020	0	0,5	9	0
vkupno	105	28950	3515	18930	57	31	17,5	48,6

In the period from 2007 to 2011 of disinfectant and antiseptics used in the solid state, in 2007 spent the greatest amount of Formaldechide tablets (1025), and the smallest amount of Jodoform PLV (0,5 kg). In 2008 spent major amounts of Formaldehyde tablets (1650), and the smallest amount Hidreks surgic scrab (0.5 kg). In 2009 spent major amounts of Medicarine Nat. (16800 tablets), and the lowest amount Sekusept aktiv (4 kg). In 2010 spent major amounts of Medicarine Nat (10800 tablets), and the smallest amount Sekusept aktiv (4,5 kg). In 2011 spent major amounts of Suma D4 (13020 tablets), and the smallest amount Jodoform PLV (0,5kg)

The total amount of commonly used antiseptics and disinfectants in hospital departments in Clinical hospital - Stip in the period from 2007 to 2011 is shown below.

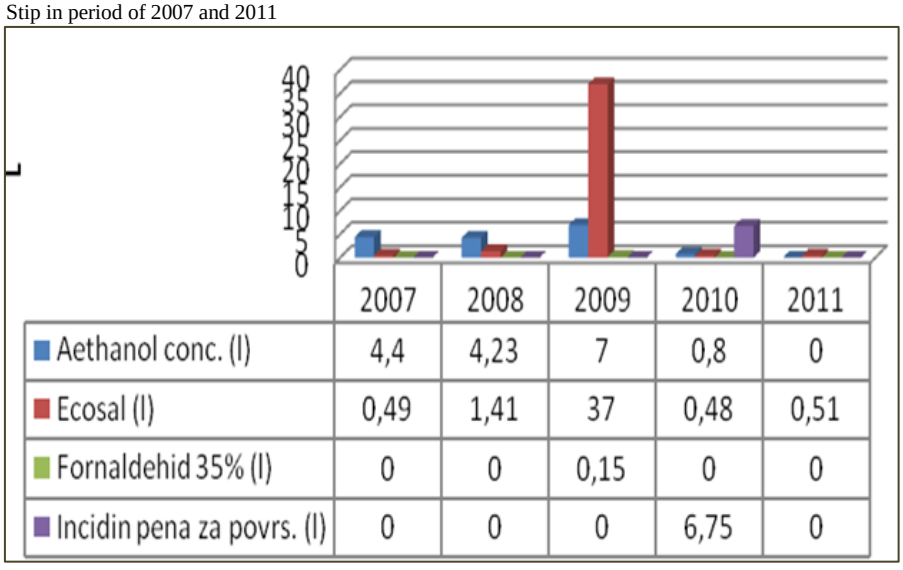
Figure-3. Quantities of antiseptics and disinfectant spent in Gynaecology department in the Clinical Hospital - Stip in period of 2007 and 2011



	Aethanol (l)	Betadine 10%(l)	Betadine 7,5%(l)	Deconex 50 AF+FF(l)	Ecosal(l)	Hidrogen conc.(l)	Incidin pena za povr.(l)	Deconex gastro (l)	Formaldehid 35%(l)	Decosept (l)
2007	0	7,5	0,5	7	0,99	0	0	0	1,12	1
2008	0	50	0	5	10	0	0	0	5	0
2009	0,25	8,5	2,5	0	0,28	0,25	2,25	7,5	56	0
2010	0,05	15	0	0	0,37	0,05	3	0	0	0
2011	0,5	13,8	0,5	2	1,27	0,5	0,75	0	0	0

Genecology department in the period from 2007 to 2011 spent major amounts of antiseptics and disinfectants in liquid form: Betadine 10% (total 94.8 L), and the smallest amount of Decosept (1 L). 2007 consumed the greatest amount of Betadine 10% (7.5 L), and the lowest amount of Betadine 7.5% (0,5 L) while Ethanol conc., Hydrogen conc., Incidin foam. Deconex gastro were not used. 2008 spent major amounts of Betadine 10% (50 L), and the lowest amount of Deconex 50 AF + FF (5 L), Formaldehyde 35% (5 L), while Ethanol conc., Betadine 7,5%, Hydrogen conc. Incidin foam., Deconex gastro and Decosept are not used at all. In 2009 are spent most of Betadine 10% (8.5 L), the lowest spent amount is Ethanol conc. (0.25 L) and Hidrogen conc. (0.25 L) while Deconex 50 AF + FF and Decosept are not used at all. In 2010 spent the least amount of Ethanol (0.05 L) and Hydrogen conc. (0.05 L), while Betadine 7.5%, Deconex 50 AF + FF, Deconex gastro, Formaldehyde 35% and Decosept are not used at all. In 2011 spent major amounts of Betadine 10% (13.8 L), and minor amounts of Ethanol conc. (0.5 L), Betadine 7.5% (0.5 L) and Hydrogen conc. (0.5 L) while Deconex gastro, Formaldehyde 35% Decosept are not used

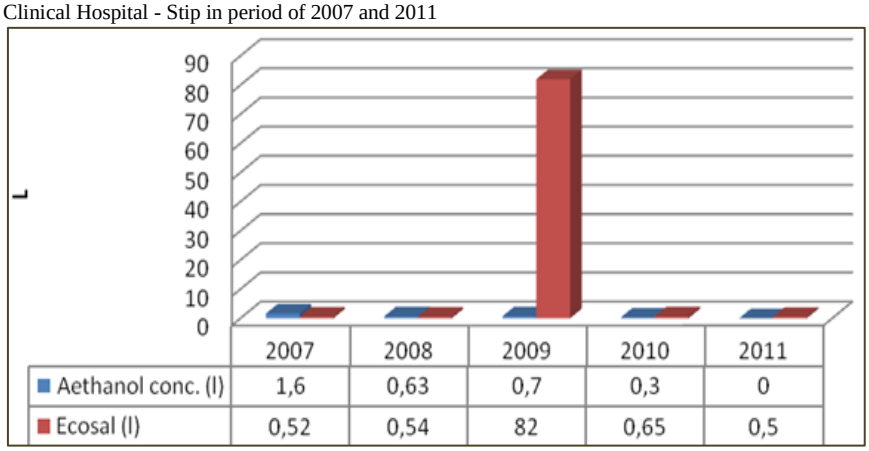
Figure-4. Quantities of antiseptics and disinfectant spent in Intensive care in the Clinical Hospital - Stip in period of 2007 and 2011



	2007	2008	2009	2010	2011
Aethanol conc. (l)	4,4	4,23	7	0,8	0
Ecosal (l)	0,49	1,41	37	0,48	0,51
Fornaldehid 35% (l)	0	0	0,15	0	0
Incidin pena za povrs. (l)	0	0	0	6,75	0

The Intensive Care unit spent largest amounts of Ecosal (total of 39.89 L), and the smallest amount of Formaldehyde 35% (0.15 L). In 2007 the largest amount is spent of Ethanol conc. (4.4 L), and the lowest Ecosal (0.49 L). Formaldehyde 35%, Incidin foam are not used. In 2008 the largest amount is spent of Ethanol conc. (4.23 L), and the lowest Ecosal (1.41 L). Formaldehyde 35%, Incidin foam are not used. In 2009 consumed the greatest amount of Ecosal (37 L) and the lowest Formaldehyde 355 (0.15 L). In 2011 was used only Ecosal and spent total 0.51 L.

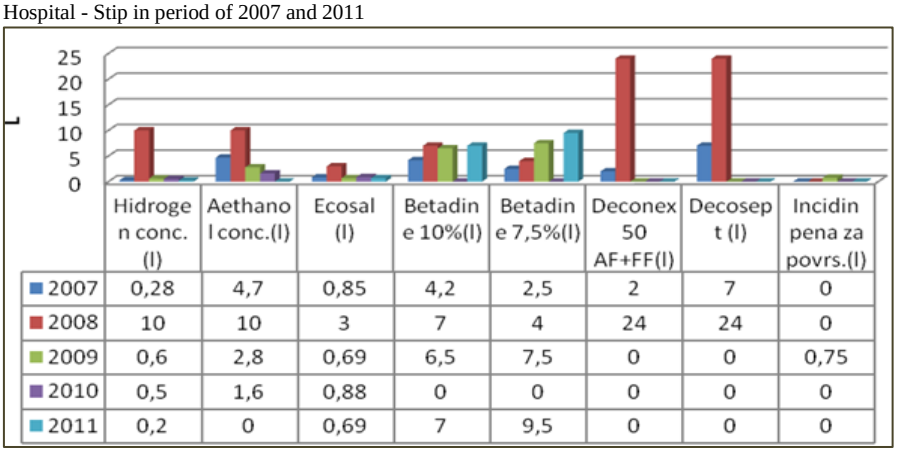
Figure-5. Quantities of antiseptics and disinfectant spent in internal medical department in the Clinical Hospital - Stip in period of 2007 and 2011



	2007	2008	2009	2010	2011
Aethanol conc. (l)	1,6	0,63	0,7	0,3	0
Ecosal (l)	0,52	0,54	82	0,65	0,5

In the Internal medical department used antiseptics and disinfectants are only Ethanol conc. and Ecosal. In largest quantities is used Ecosal (total 148.5 L) and smaller Ethanol conc. (3.23 L). In 2007 and 2008 a greater amount is spent of Ethanol conc, in 2009, 2010 and 2011 is more used Ecosal.

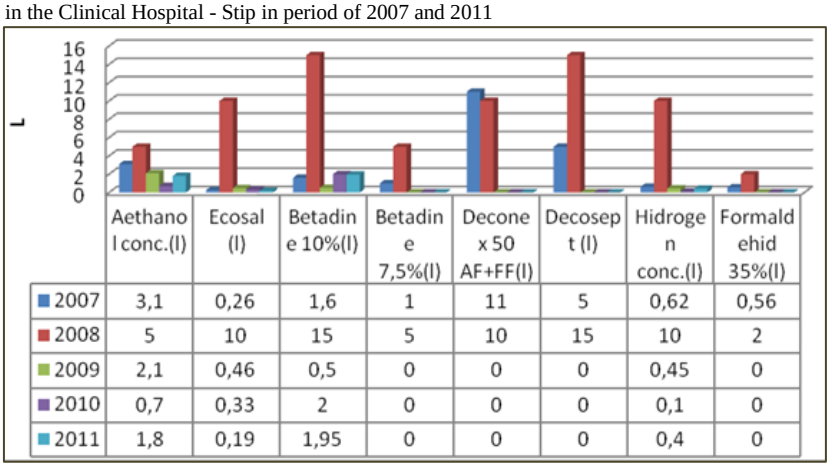
Figure-6. Quantities of antiseptics and disinfectant spent in Urology department in the Clinical Hospital - Stip in period of 2007 and 2011



	Hidrogen conc. (l)	Aethanol conc.(l)	Ecosal (l)	Betadine 10%(l)	Betadine 7,5%(l)	Deconex 50 AF+FF(l)	Decosept (l)	Incidin pena za povrs.(l)
2007	0,28	4,7	0,85	4,2	2,5	2	7	0
2008	10	10	3	7	4	24	24	0
2009	0,6	2,8	0,69	6,5	7,5	0	0	0,75
2010	0,5	1,6	0,88	0	0	0	0	0
2011	0,2	0	0,69	7	9,5	0	0	0

The Urology department spent major amounts of Decosept (31 L), and the smallest amount of Incidin foam (total of 0.75 L). In 2007 spent major amounts of Decosept (7 L), and the smallest amount of Hydrogen conc. (0.28 L), while Incidin foam is not used. In 2008 spent major amounts of Deconex 50 AF + FF and Decosept 24 L, the smallest amount of Ecosal (3 L), while Incidin foam is not used. In 2009 spent major amounts of Betadine 7.5% (7.5 L), the smallest amount of Hydrogen conc. (0.6 L) while Deconex 50 AF + FF and Decosept are not used. In 2010 spent major amounts of Ethanol conc. (1.6 L), the smallest amount of Hydrogen conc. (0,5 L), and Betadine 10%, Betadine 7,5%, Decosept, Deconex 50 AF + FF and Incidin foam are not used. In 2011 spent major amounts of Betadine 7.5%, the lowest amount of Hydrogen conc. (0.2 L) while Ethanol, Deconex 50 AF + FF, Decosept and Incidin foam are not used.

Figure-7. Quantities of antiseptics and disinfectant spent in Otorhinolaryngology department in the Clinical Hospital - Stip in period of 2007 and 2011



	Aethanol conc.(l)	Ecosal (l)	Betadine 10%(l)	Betadine 7,5%(l)	Deconex 50 AF+FF(l)	Decosept (l)	Hidrogen conc.(l)	Formaldehid 35%(l)
2007	3,1	0,26	1,6	1	11	5	0,62	0,56
2008	5	10	15	5	10	15	10	2
2009	2,1	0,46	0,5	0	0	0	0,45	0
2010	0,7	0,33	2	0	0	0	0,1	0
2011	1,8	0,19	1,95	0	0	0	0,4	0

The otorhinolaryngology department consumed largest amounts of Deconex 50 AF + FF (21 L), and the lowest amount of Formaldehyde 35% (total of 2.56 L). In 2007 spent major amounts of Deconex 50 AF + FF (11 L), and

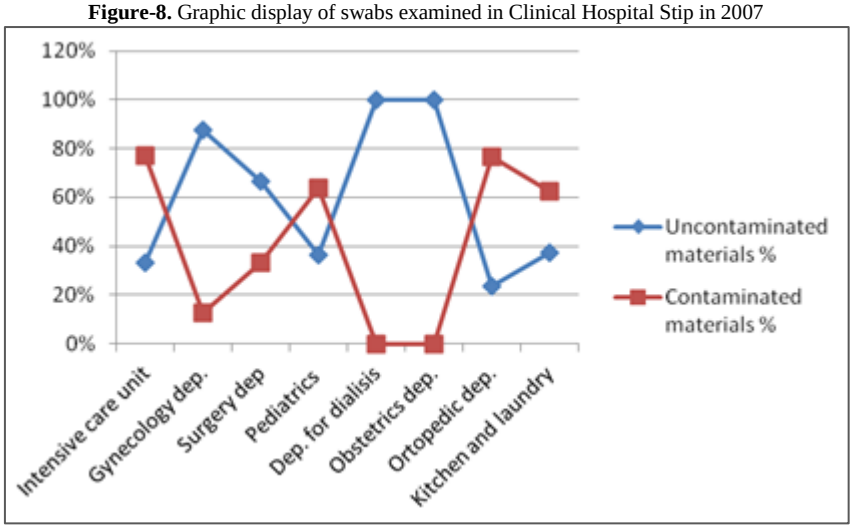
the smallest amount Ecosal (0,26 L). 2008 spent major amounts of Betadine and 10% Decosept 15 L, and the smallest amount Formaldehyde 35% (2 L). In 2009 spent major amounts of Ethanol conc. (2,1 L), and the smallest amount of Hydrogen conc. (0,45 L), while Betadine 7,5%, Deconex 50 AF + FF, Decosept and Formaldehyde 35 % are not used. 2010 spent major amounts of Betadine 10% (2 l), the lowest amount of Hydrogen conc. (0,1 L), and Betadine 7,5%, Deconex 50 AF + FF, Decosept and Formaldehyde 35% are not used. In 2011 spent major amounts of Betadine 10% (1.95 L), the smallest amount of Hydrogen conc. (0,4 L), while Betadine 7,5%, Deconex 50 AF + FF, Decosept and Formaldehyde 35% are not are used.

The results of microbiological tests on swabs taken in Clinical Hospital Stip implemented at the Centre for Public Health is shown as a percentage of contaminated and uncontaminated materials by departments and years.

Table-2. Examined swabs in Clinical Hospital Stip in 2007

Department	Uncontaminated materials %	Contaminated materials %
Intensive care unit	33%	77%
Gynecology dep.	87,50%	12,50%
Surgery dep	66,60%	33,40%
Pediatrics	36,30%	63,60%
Dep. for dialysis	100%	0,00%
Obstetrics dep.	100%	0,00%
Orthopaedic dep.	23,50%	76,50%
Kitchen and laundry	37,50%	62,50%

Figure-8. Graphic display of swabs examined in Clinical Hospital Stip in 2007

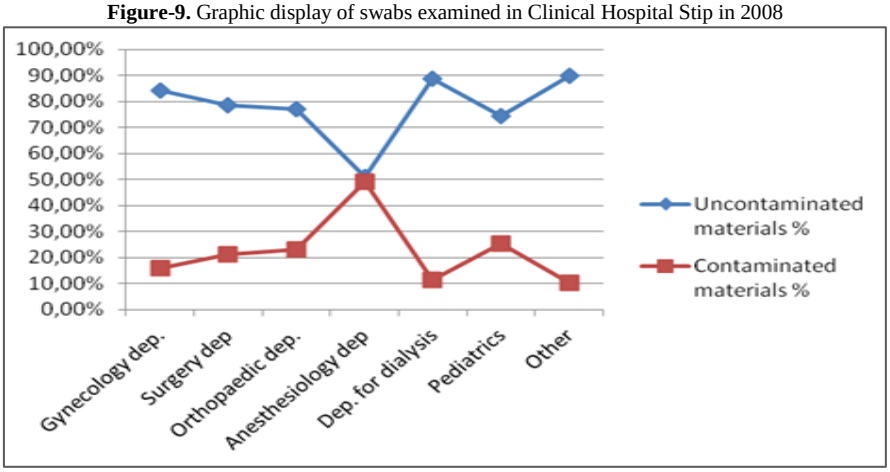


During the 2007 the Centre for Public Health has conducted 77 hygiene-epidemiological insights in several offices in Clinical Hospital Stip and other public and private health organizations in areas where is the greatest opportunity for the emergence and spread of hospital infections. The largest proportions of contaminated swabs were examined orthopaedic department where the percentage reaches 76.50% in one year. 100% uncontaminated material has been tested and proven on dialysis departments and obstetric unit.

Table-3. Examined swabs in Clinical Hospital Stip in 2008

Department	Uncontaminated materials %	Contaminated materials %
Gynecology dep.	84,30%	15,70%
Surgery dep	78,70%	21,30%
Orthopaedic dep.	77%	23%
Anesthesiology dep	50,90%	49,10%
Dep. for dialysis	88,80%	11,20%
Pediatrics	74,50%	25,50%
Other	89,80%	10,20%

Figure-9. Graphic display of swabs examined in Clinical Hospital Stip in 2008

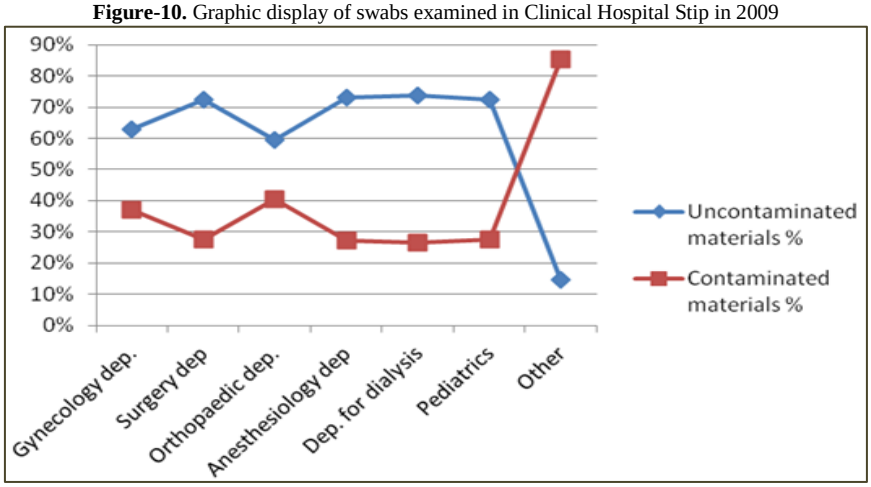


During the 2008 the Centre for Public Health Stip performed 36 hygiene-epidemiological insights in several offices in Clinical Hospital Stip and other public and private health organizations in areas where are the greatest opportunity for the emergence and spread of hospital infections. Total examined materials are 570 and 37 were spurious according to test for correctness of sterilization. Of these 480 are sterile, and in 90 of them were found present bacteria. In fact 15.7% of the materials are contaminated with bacteria. The largest percentages of swabs were contaminated at department of Anaesthesiology 49.1%, and the lowest percentage of dialysis 11.2%.

Table-4. Examined swabs in Clinical Hospital Stip in 2009

Department	Uncontaminated materials %	Contaminated materials %
Gynecology dep.	63%	37%
Surgery dep	72,50%	27,50%
Orthopaedic dep.	59,50%	40,50%
Anesthesiology dep	72,90%	27,10%
Dep. for dialysis	73,60%	26,40%
Pediatrics	72,50%	27,50%
Other	14,80%	85,20%

Figure-10. Graphic display of swabs examined in Clinical Hospital Stip in 2009

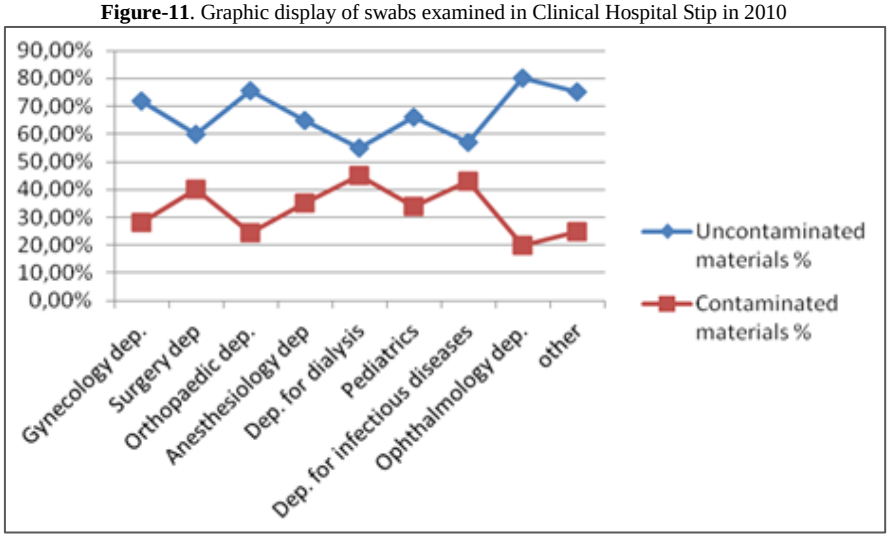


In 2009, were performed 34 hygiene-epidemiological insights in several offices in Clinical Hospital Stip and other public and private health organizations in the areas where are the greatest opportunity for emergence and spread of hospital infections. Once a month were taken materials for microbiological examinations (sediment air, swabs of surfaces and instruments and testing the accuracy of sterilization). Total surveyed 376 materials and 16 spores. 244 of this were sterile, and in 99 were found present bacteria. In fact 26.3% of the materials are contaminated with bacteria. The largest percentages of swabs were recorded at the Department of Orthopaedics 40.5% and 26.4% at department for dialysis.

Table-5. Examined swabs in Clinical Hospital Stip in 2010

Department	Uncontaminated materials %	Contaminated materials %
Gynecology dep.	71,80%	28,20%
Surgery dep	60%	40%
Orthopaedic dep.	75,40%	24,60%
Anesthesiology dep	64,90%	35,10%
Dep. for dialysis	54,90%	45,10%
Pediatrics	66,20%	33,80%
Dep. for infectious diseases	57,10%	42,90%
Ophthalmology dep.	80%	20%
other	75%	25%

Figure-11. Graphic display of swabs examined in Clinical Hospital Stip in 2010

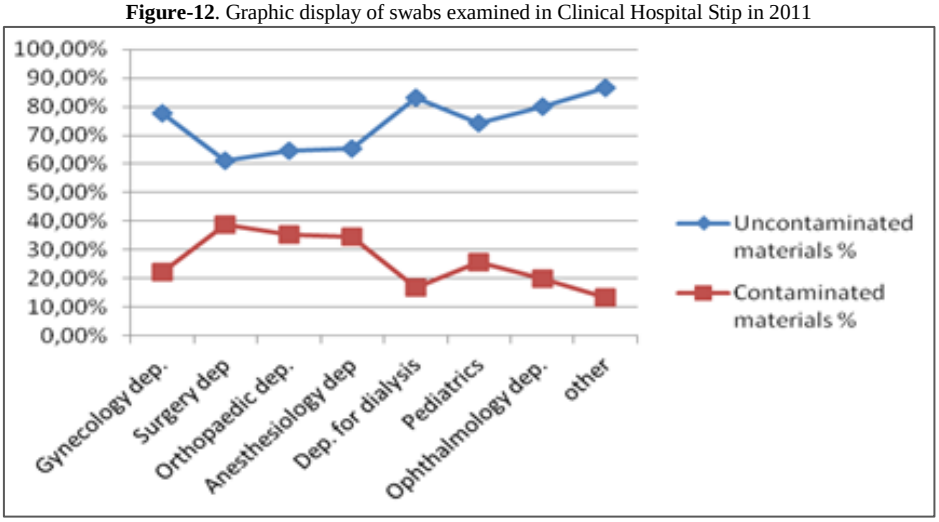


In 2010 epidemiological service of the Centre for Public Health conducted 49 hygiene-epidemiological insights in Clinical hospital Stip. Total 604 materials were examined. 436 of these were sterile and at 168 were found present bacteria. In fact 27.8% of the materials are contaminated with bacteria. The highest level of contamination was found at department for dialysis 45.1% and the ophthalmology department with 20%. From hospital sterilization area were taken 24 spores and all were negative.

Table-6. Examined swabs in Clinical Hospital Stip in 2011

Department	Uncontaminated materials %	Contaminated materials %
Gynecology dep.	77,70%	22,30%
Surgery dep	61,20%	38,80%
Orthopaedic dep.	64,70%	35,30%
Anesthesiology dep	65,50%	34,50%
Dep. for dialysis	83%	17%
Pediatrics	74,30%	25,70%
Ophthalmology dep.	80%	20%
other	86,60%	13,40%

Figure-12. Graphic display of swabs examined in Clinical Hospital Stip in 2011



In 2011 epidemiological service of the Centre for Public Health Stip perform 58 hygiene-epidemiological insights in Clinical Hospital Stip in areas where is the greatest opportunity for emergence and spread of hospital infections.. During this year were examined total 587 materials. 462 of these were sterile and at 125 were found present bacteria. In fact 21.2% of the materials are contaminated with bacteria. The greatest percentage of contamination was found at surgery department 38.8% and 17% department for dialysis. From hospital pharmacy were taken seven samples of distilled water. All samples were without bacterial contamination.

5. Conclusions

In relation to Article 49 of the Law on protection of the population from infectious diseases, Official Gazette No. 66 of 01.10.2004 and the Rulebook on the criteria for prevention and elimination of intra-hospital infections, Official Gazette of RM No. 25 of 20.02.2008, and in order to prevent and eliminate intra-hospital infections, shorter hospitalization and reducing of the cost of treating inpatients, the Programme for the Prevention and suppression of intra-hospital infections was adopted, which is led by the hospitals in eastern part of Macedonia. Clinical Centre - Stip as the centre of this region represents the situation. The amount of disinfectants and antiseptics consumed comparing with the microbiological data indicates their rational utilization starting from 2011. Use of disinfectants according to the standardized procedures established by the IHI times allows current daily care. The knowledge about the current situation permits the staff to take proper precautions. It is pointed out the role of IHI times in the hospitals, as well as the role of hospital pharmacists.

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