

*Full Length Research Paper*

# Comparing the efficacy of alcohol isopropyl and ethanol on the reduction of contamination of medical check-up devices in children ward and neonatal intensive care unit (NICU)

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Using alcohols have been recommended for disinfecting and prevention of infections. The present study has been carried out with the aim to determine and compare the efficacy of alcohol Isopropyl and Ethanol (alcohol Ethylic) in reducing contamination of medical check-up instruments. This semi-experimental study has been carried out to compare the influence of two types of alcohols on the medical check-up instruments of NICU and children ward. Before using instruments, their culture samples were prepared and then were disinfected by alcohol Isopropyl 70.0% and again their culture samples were taken. Thereafter, the same procedure was carried out for Ethanol 70.0% with the interval of 4 weeks. Finally, the culture results were surveyed and compared in each stage. The results of cultures before disinfecting the instruments showed the existence of micro-organisms like Staphylococcus, Escherichia-Coli (E-Coli), Pseudomonas and Interobacterococci. Also, the results of cultures of instruments which were disinfected by Ethanol showed the existence of two types of positive micro-organisms (Staphylococcus and E-Coli) while these results were negative after using alcohol Isopropyl. Using some of antiseptics at intensive and other wards of hospitals can be considered from the view points of economic, rapid efficacy, non-requirement of long time or requiring specific conditions so as to be successful in controlling the nosocomial infections.

**Key words:** Comparison, Efficacy, alcohol Isopropyl, Ethanol, contamination, check-up instruments.

## INTRODUCTION

Pathogen and contagious factor can sicken the sensitive host directly or indirectly. The direct transmission takes place by contaminated instrument, hand, carriers, air and food. If this transmission occurs at hospital environment, it is supposed to be nosocomial infection (Shojaee and Malekafzali, 2004).

Studies show that nosocomial infections are a worldwide problem which its minimum prevalence rate is estimated to be between 12-60 % (Plowman et al., 2000).

and it some developing countries, it is 65 % (Asl and Afhami, 2005). Nosocomial infection may occur in relation with long period hospitalization, the existence of companion diseases and the types of treatment measures. This exclusivity in neonate intensive care unit (NICU), pediatric and other some wards in which the person many resides for several hours or months and need medical intervention, increases the risk of infection and mortality(Gorji, 2002; Phillips et al., 2000). Controlling vital signs, measuring blood pressure, doing physical examination, are among the diagnostic and nursing measures which usually take place for the patients. Sometimes, the required instruments for the mentioned cases are not used for one person exclusively,

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will be generalized and can be contaminated. Therefore, at neonate and pediatric wards in which children many reside from several hour to several months and need examination, intervention and control (Gorji, 2002), the instruments should be used exclusively properly. The disinfection process mean destroying pathogen agents out of body using physical and chemical materials. One of the chemical materials which is used at hospital like many other disinfectants is alcohol and among them, isopropyl and ethyl alcohol are used more (Shojaee and Malekafzali, 2004).

The present research has been designed and performed with the aim to compare the effect of these two alcohols for disinfection of instruments used medical common examinations at the pediatric and neonate intensive care units.

## METHODOLOGY

The present study is of semi experimental type carried out at Emam Sajad Hospital of Yasouj city during the year 2007. The required sample for the research were selected from pediatric and neonate intensive care unit consisting of medical examination instruments (totally 29 instruments) like stethoscope, thermometer, laryngoscope, ophthalmoscope and stethoscope of students who were training at the time of proposal performance. At the first stage, samples were taken from medical examination instruments by a sterile swab soaked with physiologic serum and were transmitted on agar culture environment. Therefore, immediately the surfaces of same instruments were disinfected and cleaned with sterile cotton soaked with Ethanol alcohol 70% (for period of 30-60 seconds depending upon the size and surface of the instrument). After disinfection, Some samples were prepared from the surface of the above instrument and transmitted to the agar culture environment and were sent to the laboratory along with the pre disinfection samples (totally 58 cases) and kept for 48 hours in the incubator and the culture result were then recorded .Four weeks later, in the second stage, the same procedure was repeated at pediatric and neonatal intensive care unit and then time, Isopropyl alcohol 70% was used as disinfection instead of Ethanol alcohol.

It is necessary to mention that during all study of proposal, the person responsible for taking sample and, culture environment, technician who is doing culture and the period of culturing were fixed and carried out with a single method from the aspect of sampling and the way of disinfecting and as double blind (the disinfectant person and laboratory technician were unaware of the type of applied material at each stage). Then, the collected data were analyzed using inferential statistics and variance analyzes and the frequency tables were prepared. Meanwhile, in order to confirm better effect of one of two alcohols on observed microbes while performing research, complementary part of the study

was designed; in such a way that, 10 pieces of thermometer were contaminated by the cumulating of microorganism of Klebsiella, Enterobacter, Pseudomonas, Escherichia-coli and Staphylococcus (two thermometer for each microbe) and then, both thermometers were disinfected by Ethanol alcohol and Isopropyl alcohol respectively. Therefore, some sample were collected for culture from the surface of instrument and then to the laboratory. After obtaining the culture answers, their results were compared with each other.

## RESULTS

At the first stage, before disinfecting the under studied medical instrument at pediatrics and neonate intensive care unit, the culture results of samples taken from 29 cases of medical instrument indicated 11 contamination cases with the Klebsiella, Enterobacter, Pseudomonas, Escherichia-coli and Staphylococcus. After disinfecting the aforesaid instrument with Ethanol alcohol, two cases of positive culture were reported from the instrument of pediatric ward. In the second stage, 11 cases of positive culture were also observed before disinfection (same as first stage) but, after disinfecting the instrument with Isopropyl alcohol, no positive culture was seen (Table 1 below).

Based on the finding of complementary and final part of the proposal, the culture result of contaminated thermometers which were washed with Isopropyl alcohol were negative. But, among the taken samples from contaminated thermometers which were cleaned with Ethanol-alcohol, one-case-of-positive-culture (Staphylococcus) was reported (Table 2 below).

## DISCUSSION AND CONCLUSION

The results of samples which were taken from the surface of medical instruments (29 cases) before disinfection and using for patients, showed the evidence of microorganisms like Klebsiella, Enterobacter, Pseudomonas, and Staphylococcus which are the important and dangerous factor of nosocomial infection .Specially Staphylococcus which is the second nosocomial acquired prevalent infection (Kernodle, 2000, Youngster, 2008), Escherichia-coli is the main creating factor of urinary infection and Pseudomonas is the basic factor of infection of lower respiratory system which is the third prevalent factor of nosocomial infection and in some wards like intensive care unit is possessing the first rank (Fauci et al., 1998).

Regarding the observation of such microorganisms, the same results have been obtained from various researches. Among them, in a research carried out as prospective (year 2004), random and double blind in pediatric cardiology group of Medres hospital of India by (Parmar et al., 2004) for 4 stage the culture were taken

**Table1.** The culture results before and after disinfecting the medical instruments by two type of alcohol at pediatric and neonate intensive care unit of EmamSajad hospital Yasouj, 2005

culture results of medical instrument at various stage		Positive culture result(first stage)		positive culture result(second stage)	
Ward	Instrument (numbers)	Before disinfection	After disinfection by Ethanol alcohol	Before disinfection	After disinfection by Isopropyl alcohol
Pediatric ward	11	4	2	6	-
Neonate					
Intensive Care Unit	18	7	-	5	-
Total	29	11	2	11	-

**Table 2.** The positive culture cases after disinfecting the medical instruments by two type of alcohol at laboratory environment

Agent \ Alcohol type	Staphylococcus	Pseudomonas	Klebciealla	Esherichiacoli	Enterobacte
Isopropyl alcohol	-	-	-	-	-
Ethanol alcohol	+	-	-	-	-
Total	1	-	-	-	-

from stethoscopes and the results showed that, 90% of them were contaminated by one or more microorganisms and the most observed microorganisms at laboratory were Coccoi gram positive (Parmar et al., 2004). Another study was done by (Marinella et al., 1994) in internal medicine of Michigan university. In this study, the culture was taken randomly from ring and diaphragm of 40 medical stethoscopes before using. The culture results showed the existence of 11 microorganisms at the stage before using and disinfecting the stethoscopes. Negative coagulas Staphylococcus was existed on 100% of stethoscopes and Areous staphylococcus on 38% of stethoscopes (Marinella, 1997). Another study was done by (Zuliani et al., 2002) at biological and medical sciences center of Brazil. Out of 300 medical stethoscopes belong to the personal which were selected from different wards of hospital randomly showed that, 87% of stethoscopes were contaminated by cocci gram positive, Fungies, Yeasts and gram positive and negative Bacillus's. Also, Areous staphylococcus, negative coagulas and Bacillus were observed more than other microorganisms (Maldonado, 2002).

In the present study, the culture results of medical examination instruments, after disinfecting indicate that two positive cultures Streptococcus and Esherichiacoli were reported at pediatric ward after cleaning the instruments, with Ethanol alcohol 70% but, no positive case was reported at Neonatal Intensive Care unit. The culture results of instruments of both wards which were

disinfected by Isopropyl alcohol 70% were reported negative totally.

In this respect, the results of researches done by (Marinella et al., 1994; Kennedy et al., 2003) regarding disinfecting of medical examination instruments by disinfectant, indicate the more and better influence of Isopropyl alcohol as compare with other disinfectants (Maldonado, 2002, Kennedy et al., 2003). It is necessary to mention that, the culture result prepared from laryngoscope in the both stage of present proposal lacked from any microorganism. This may be due to the reason that, laryngoscope is used less or it is well disinfected after each time usage.

The results of last part of proposal (soaking the thermometer with microbial cumulating and their later disinfecting with Isopropyl alcohol and Ethanol alcohol) was the reported of one case of positive culture (Streptococcus) after disinfecting the thermometer by Ethanol alcohol. The accessibility to the same study in this regard was not feasible. But, as it is mentioned, the study results of (Marinella et al., 1994; Kennedy et al., 2003; Maldonado 2002, Kennedy et al., 2003), emphasized on better disinfecting influence of Isopropyl alcohol. And, the finding of researches done by (Lecat et al., 2009) showed cleaning stethoscope with ethanol and isopropyl alcohol pads significantly reduced the numbers of colony-forming units (by 92.8% and 92.5%, respectively), but neither was found to be statistically superior (Cropp et al., 2009).

As we know, alcohols also like much disinfectant are being used in environments like hospital. Ethanol alcohol 70% at 30 degree temperature kills the Bacterium within 1-2 minutes but, at higher or longer concentration has less influence. But, at present, Isopropyl alcohol 70%and 90% is supposed to be the best common disinfectant substance for instruments, skin surface,etc (Ghotbi and Esfandiari, 2005). At the performing study of this research and received culture results from laboratory no Fungus any existence was reported to study the effect of alcohol on it. As a whole the acquired result of this research is an indication of better influence of Isopropyl alcohol .We may say that, since enough temperature and time is required for better effect of Ethanol alcohol and considering the necessity of quick action at sensitive ward and also shortage of personal, it is better to use some specific substances with rapid influence and without requiring spatial condition and Isopropyl alcohol is possessing such specialists . Although, it may be better to carry out more extensive studies in this respect. For this purpose, it is suggested to perform such studies for all available instruments at the wards of other hospital and the result being compared with each other.

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