

# **Assessing the Knowledge of Carcinogenic Potential of Triclosan based Dentifrice and Mouthwash among Dental Students and Practitioners – A Survey.**

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## **Abstract:**

**Background:** Triclosan is an antimicrobial agent that is widely used in consumer products. Triclosan has been readily absorbed into human skin and oral mucosa and found to be retained in the body for longer periods causing carcinogenic effects. This ingredient is widely used in dentifrices and mouthwashes, a daily consumer product which facilitates the need for this study.

**Aim:** The main aim of the study is to assess the knowledge about the carcinogenic potential of triclosan among the dental professionals

**Materials and methods:** A descriptive cross sectional survey was conducted among dental professionals. A total of 186 participants participated in the knowledge assessment survey and a questionnaire containing 16 questions was prepared and distributed online using Google survey forms and responses were collected, tabulated in excel and statistically analyzed using SPSS. The knowledge assessment was evaluated depending on the level of education.

**Results:** The results of the study showed that the upcoming professionals, the first years and the second years are more aware of the chemical ingredient triclosan than an intern or a dental practitioner. 37.63% of participants were in the poor category, 34.41% of participants were in the moderate category and 27.96% were in the good category.

**Conclusion:** This study educates the triclosan's ill effects from toothpastes and mouthwashes which became a mandatory personal care product in daily life and then implements this knowledge as awareness to the general public.

**Keywords:** Triclosan, Dentifrices, Mouthwashes, Carcinogenic potential, Dental students, Dental practitioners

### **Introduction:**

Triclosan (TCS) is a poly chloro phenoxy phenol used as an antimicrobial agent, that its original usage was evoked in 1972 in hospital settings(1).Triclosan has been used to greater extent that about 75% of the population are likely exposed to triclosan by means of consumer goods and personal care products like soaps, hand sanitizers,toothpastes and mouthwashes(1).Recent evidences states that triclosan that has been absorbed by the body gets retained and disrupts the biological processes leading to development of carcinogenesis.The amount of triclosan levels greatly depends upon the site being measured such as skin, blood & urine and it also depends upon the concentration of exposure and type of exposure which is different for different person(2). Accidental ingestion of 1 tablespoon of a triclosan containing mouthwash causes an increase of approximately 1 $\mu$ M in plasma within 1 to 3 hours(2). Oral exposure mouth rinse used for 30 seconds daily containing 0.03% triclosan resulted in 0.26-0.33 $\mu$ M in total plasma levels(3).The retention of triclosan in oral mucosa is 4 to 13% when using mouth rinse containing 0.03% of triclosan and 25% when brushing teeth with 0.2% triclosan containing toothpaste(3,4).Triclosan usage was banned from soap products by U.S.A food and drug administration(FDA) but still remains in personal care products(1). European Union(EU) banned triclosan from all hygiene biocidal products in January 2017(1).

Even though there are many health adverse effects as previous literatures suggests, this study concentrates on the carcinogenic potential of triclosan because incidence of cancers alters the quality of life to a greater extent.No other studies have been done to assess the knowledge of carcinogenic potential of triclosan.Hence, the aim of this survey was to analyze the knowledge of carcinogenic potential of triclosan in dentifrice and mouthwashes among dentists. Dentists were chosen as our study population, as to educate them about triclosan's ill effects from toothpastes and mouthwashes which became a mandatory personal care product in daily life and then implement this knowledge as awareness to the general public.

### **Materials and methods:**

Study design and study participants:

This cross sectional study was conducted using an online (electronic based survey) based questionnaire that was distributed among pre-clinical Bachelor of dental surgery (BDS) students (1st & 2nd year), clinical BDS students (3rd & 4th year), interns, postgraduates and dental practitioners. The survey was distributed among potential participants during October 2019 to December 2019. The target population of the study was all BDS students up till postgraduates and practitioners with the aim of reducing coverage error of the survey. The study included 183 participants distributed among various preclinical and clinical students and doctors. A simple random sampling was used to select the participants. The participation in the survey was voluntary. No incentives were provided to the survey participants. The study was approved by Saveetha dental college & hospitals, Saveetha University institutional review board (IRB).

#### Survey method:

The survey was constructed as an online survey using Google forms. The survey instrument, the questionnaire aimed to assess the knowledge of both the students and practitioners regarding a common ingredient like triclosan. The survey consisted of 16 open end and closed end simple questions which included age, gender, qualification, current level of education (BDS & MDS) and a set of questions 9 related to triclosan knowledge. English language was used in the survey. The survey was conducted online by Google forms. The collected data were checked regularly for clarity, consistency and accuracy. The knowledge assessment survey took approximately 5-10 minutes to complete. The participants were not allowed to refer to any source until completion of the survey forms.

#### Data collection:

Ethical approval for this study was approved by Saveetha dental college & hospitals, Saveetha University. The data for this study was collected with the participants who volunteered to take part in a knowledge assessment survey. The data collected were anonymously scored with their answers to the 9 triclosan based survey questions. Each correct answer was given a 10 point score with a total 90 point score for each participant. The overall score was categorized as poor = <30; moderate = 31-60 and good = 61-90. Only completely filled forms were included for analysis. The data was verified by two other examiners before analysis.

#### Statistical analysis:

Statistical analysis was conducted through IBM SPSS statistical software version 20.0. To compare the mean score for triclosan based survey questions across different educational levels with Categorical data was analyzed using Chi Square. The scores between the years of study were compared using

ANOVA. The Spearman correlation was used to assess if year of study and age correlated with awareness levels. Cronbach's alpha was used to analyze the reliability of the responses.

### **Results:**

The total of 183 participants was included in the survey. Cronbach's analysis was done on the knowledge assessment questions of the survey. It was found that the alpha value was between .777 and .823 which indicates the high reliability of the responses obtained from the participants for knowledge assessment questions.

Among 183 study participants, 154 (82.80%) were in the age group of 17-25; 31(16.67%) belong to the age group of 26-35 years and 1(0.5%) were in the age group of 36-45 years (figure 1). About three-fourths of the study population were females with 134(72.04%) and 52(27.96%) were males (figure 2). In total, 179 (96.2%) students and 7(3.8%) practitioners participated in the survey. The responses received based on the level of education included 56(30.11%) were first year students, 55(29.57%) were second year students, 18(9.68%) were third year students, 29(15.59%) were fourth year students and 21(11.29%) were interns (figure 3). The highest response rate was among 1st year followed by 2nd year preclinical students & postgraduates.

The knowledge analysis was done with respect to scores; the participants were almost evenly distributed among each category. 70(37.63%) of participants were in the poor category, 64(34.41%) of participants were in the moderate category and 52(27.96%) were in the good category (figure 4).

Overall, second year students had significantly higher knowledge about triclosan, followed by first years with  $p$  value = 0.000 ( $p < 0.05$  statistically significant). Also the more participants were seen in the poor category followed by first years. The first year students have almost been equally distributed between poor, moderate and good categories (table 1).

The majority of the participants who took part in the survey were between 17-25 years of age group with 60 (32.25%) in the poor category followed by 52(27.95%) being in the moderate category. In the age group 26-35, the majority of the participants were in the moderate category. The  $p$  value = 0.649 ( $p > 0.05$  statistically insignificant) (table 2) (figure 5).

Among the participants 48(25.8%) of females had good knowledge, this was higher compared to males who had 22(11.8%) of knowledge on Triclosan. However there was no statistically significant difference between the genders ( $p = 0.596$ ) (table 3) (figure 6).

Only the year of study had a difference in Triclosan awareness. The first year and second year students were higher than that of the final year students. This was found to be statistically significant ( $p=0.001$ ).

**Discussion:**

Triclosan is a chemical compound that has been widely used in paste or gel dentifrice, an essential consumer product because it is an antimicrobial agent(5). The triclosan chemical is an inhibitor of enoylacyl carrier protein reductase which kills microbes by inhibiting the fatty acid biosynthetic pathway disrupting lipid synthesis and eventually kills the cell of microbes(5). This property of triclosan initiated its usage in consumer products and its efficacy has been tested widely. Rola al habashneh, et, et al(6) found that toothpastes containing triclosan additional to fluoride results in higher reduction in plaque, gingival inflammation and gingival bleeding when compared with fluoride toothpastes without triclosan. Riley, et al.(7) did a review on randomized controlled trials assessing the effects of triclosan containing toothpastes on oral health and observed there is no need to have any serious safety concerns regarding the use of triclosan toothpastes. Also few previously existing literature attempted to prove triclosan does not accumulate in blood and plasma who regularly use triclosan containing toothpaste and identified that elimination of daily triclosan dose is complete and no accumulation of triclosan was observed even after three times daily tooth brushing with 1.25g toothpaste containing 0.3% triclosan(8). In contradiction, Bradley Drury et al. (9) has with his field survey and artificial stream experiment indicated that there was a significant correlation between sediment of triclosan concentration and a proportion of cultivable benthic bacteria that were resistant to triclosan. Also Thidarat et al (10) triclosan mediates epithelial mesenchymal transitions that enhance the ability of the cells to migrate and invade; showing the potential effect of triclosan may result in carcinogenesis or may potentiate aggressiveness of existing cancer. So there has always been a dilemma in terms of usage of triclosan because of its positive effects as well as the dominating ill effects. This study was chosen to be conducted among dental professionals to assess their knowledge on the ill effects caused by the chemical triclosan that is commonly used by most of the patients.

This study result showed that first year and second year students were more likely to have knowledge regarding the chemical triclosan. Even though the efficacy of triclosan has been proved to show positive outcomes, the negative effects of triclosan is an emerging topic of debate in recent years. Because of no upgrades on theoretical buildup about recent changes & advances, final years, interns as well as practitioners are not much aware of the chemical. There are also no evident differences

appreciated between a dental practitioner and a dental student in regards to knowledge about triclosan. This might be due to the discrepancy in the number of dental practitioner participants. Not many dental practitioners have participated in this knowledge assessment survey. There was also no variation in knowledge regarding the ill effects of triclosan between male and female.

As a dental professional, adequate knowledge about the ingredients that have been used widely in dentifrices (a daily consumer product) is necessary. This sound knowledge among the dental fraternity facilitates reassurance before advising a product to a patient or warns the patients regarding its negative health effects.

The authors acknowledge few limitations. There is a presence of discrepancy in the student and dental practitioner participation which did not facilitate an efficient comparison between groups.

### **Conclusion:**

Our present study assessed the knowledge about triclosan among dental professionals to emphasize the importance of adequate knowledge of ingredients in commonly prescribed mouthwashes and toothpastes used by the patients. This is required to educate the patient and reassure them from an unwarranted panic.

### **Acknowledgement:**

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**Figure legends:**

Figure 1 depicting the bar chart of distribution of age among the participants.

Figure 2 depicting the bar chart of distribution of gender among the participants.

Figure 3 depicts the bar chart of distribution of level of education among the participants.

Figure 4 depicting the bar chart of distribution of the overall score category of the participants.

Figure 5 depicting the bar chart of association between the age groups and the overall score category.

Figure 6 depicts the bar chart of association between gender and the overall score category of the participants.

Table 1 showing the percentage value of correlation between the scoring criteria and level of education with its p value.

Level Of Education	Poor	Moderate	Good	P Value Chi Square	P value Anova
First year	9.6%	10.75%	9.6%	<b>0.00*</b>	0.184
Second year	9.13%	9.13%	11.29%		
Third year	3.76%	4.3%	1.61%		
Final year	12.36%	1.61%	1.61%		
Interns	1.61%	6.98%	2.6%		
Practitioners	1.07%	1.61%	1.07%		

Table 2 showing the percentage value of correlation between the scoring criteria and age with its p value.

Age	Poor	Moderate	Good	P Value Chi Square	P value Anova
17-25	32.25%	27.95%	22.58%	0.649	0.649
26-35	5.32%	5.91%	5.32%		
36-45	0	0.5%	0		

Table 3 showing the percentage value of correlation between the scoring criteria and gender with its p value.

Gender	Poor	Moderate	Good	P Value Chi Square	P value Anova
Female	25.80%	24.73%	21.50%	0.596	0.600



Male	11.82%	9.67%	6.45%		
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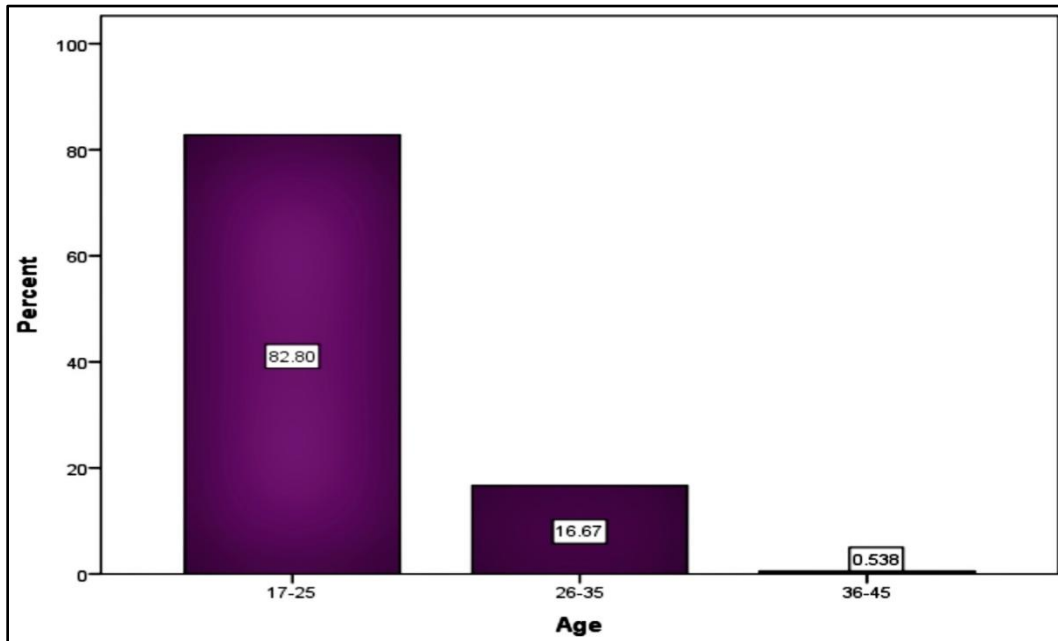


Figure 1 depicting the bar chart of distribution of age among the participants.

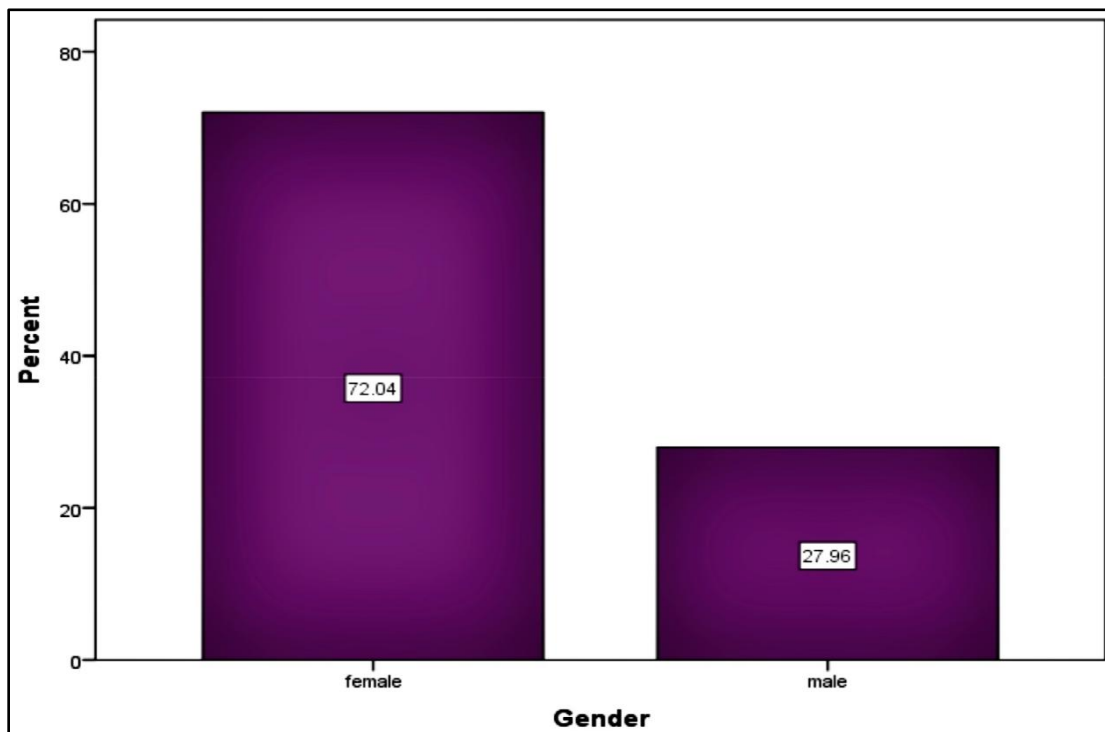


Figure 2 depicting the bar chart of distribution of gender among the participants.

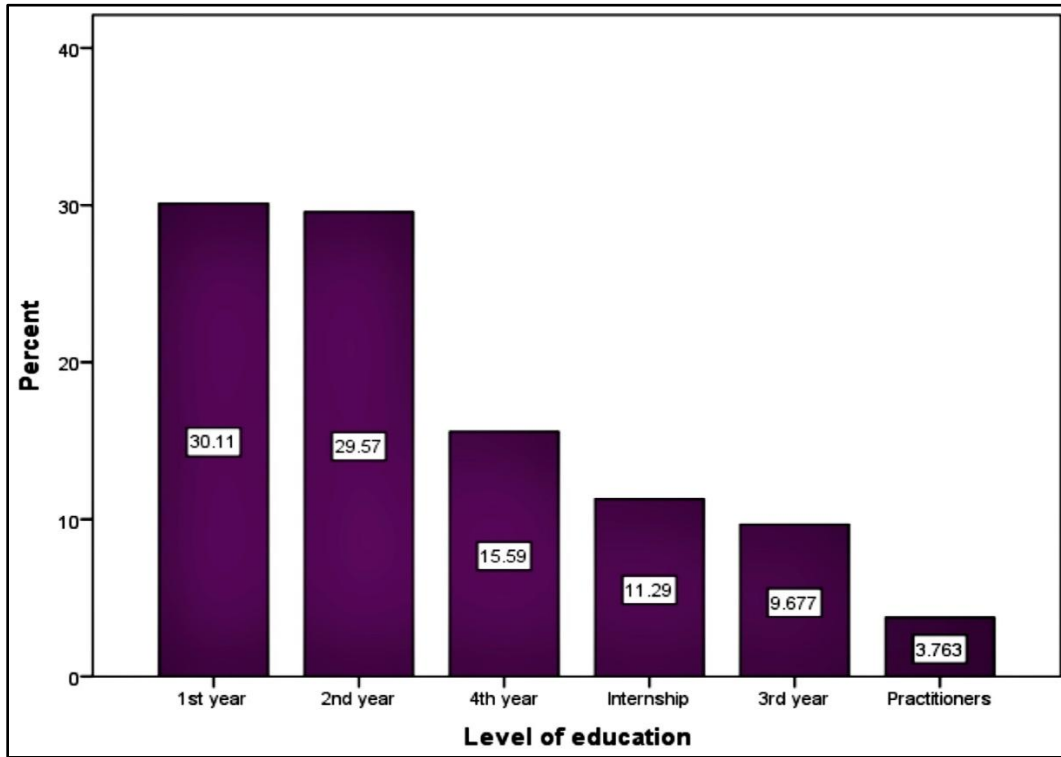


Figure 3 depicting the bar chart of distribution of level of education among the participants.

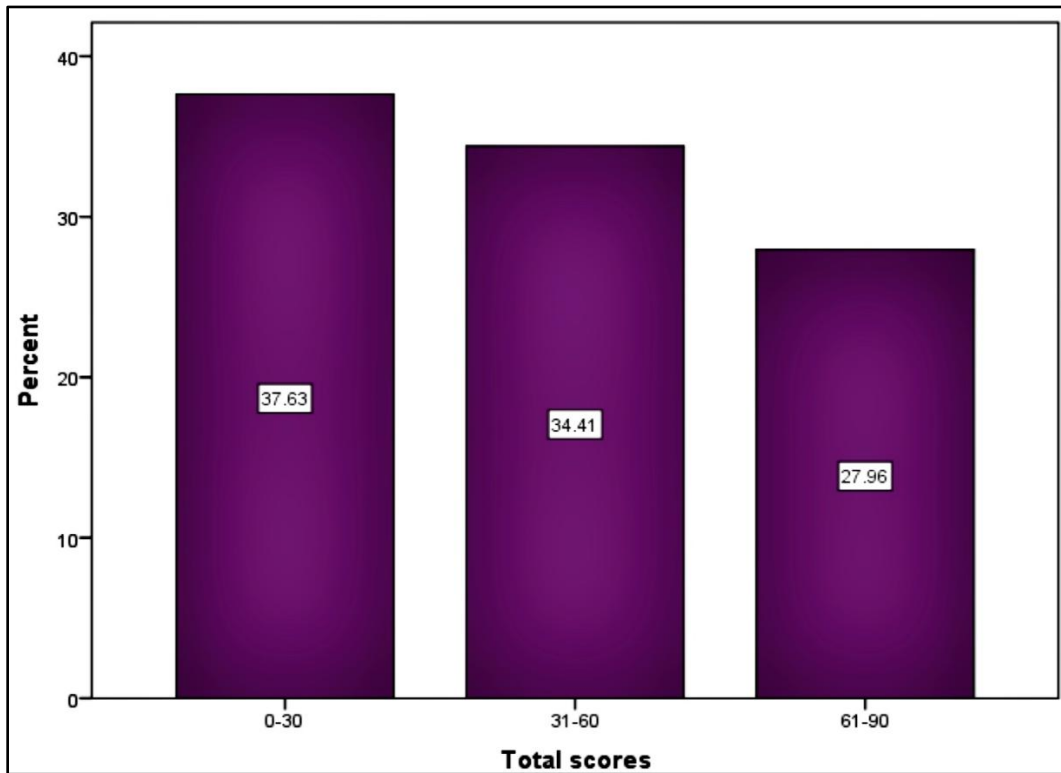


Figure 4 depicting the bar chart of distribution of overall score category of the participants.

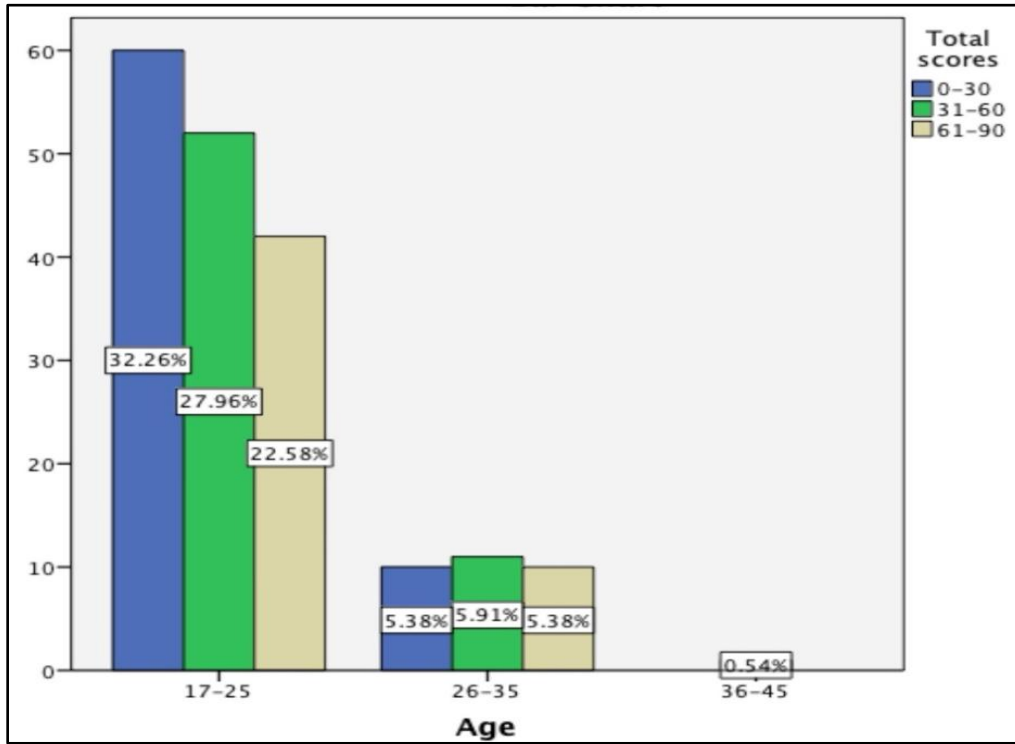


Figure 5 depicting the bar chart of association between the age groups and the overall score category.

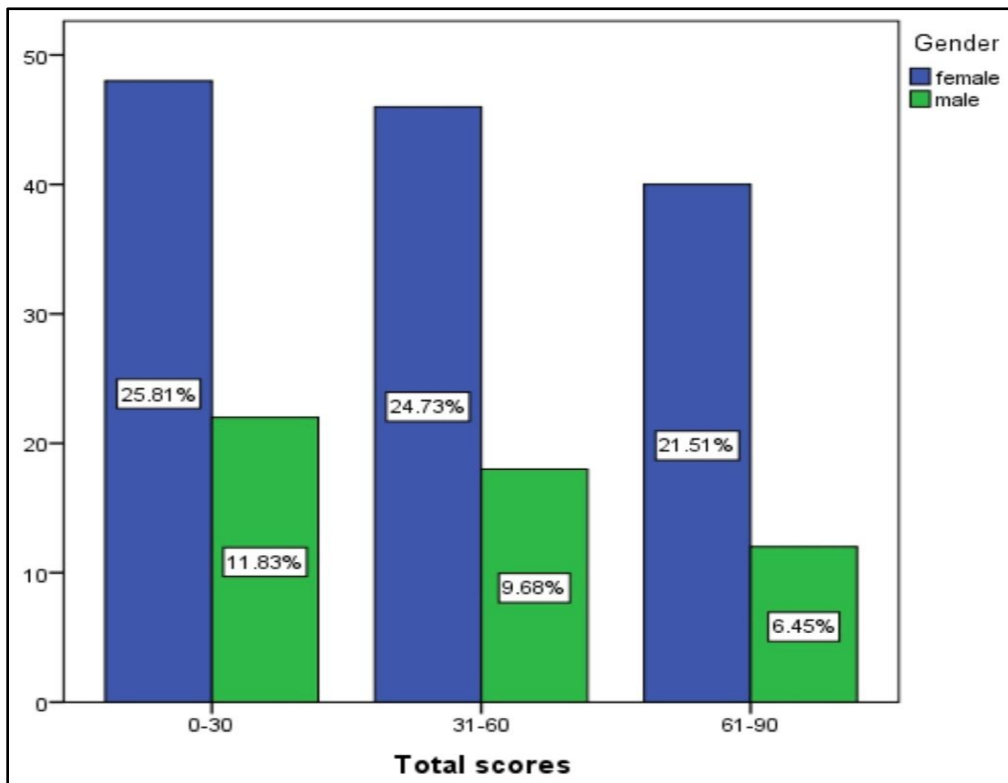


Figure 6 depicting the bar chart of association between gender and the overall score category of the participants.