Association between rheumatoid arthritis with gender, age, obesity and smoking among middle aged and old aged population - A Survey

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ABSTRACT

As the population of teenagers and middle-aged humans increases, the number of smokers and the people associated with various diseases due to this habit also increase. The reason for the number of increased smokers arises due to peer pressure and other factors such as anxiety and stress. One such disease associated with smoking is rheumatoid arthritis which is characterised by inflammation of joints. The present study was conducted to understand the influence of various factors such as gender, age and smoking with the risk of occurrence of rheumatoid arthritis. For the present study, a self-administered questionnaire comprising 15 questions was prepared and circulated via an online google form link. The results obtained were recorded and analysed using the SPSS software version 22, and the statistical test used was descriptive statistics. From the present study, it was observed that a majority of the participants were aware of the rheumatoid disease arthritis and believed that hormones such as estrogen could increase the risk of rheumatoid arthritis. Majority of the population also found that nicotine from cigarettes can increase the occurrence of RA. The present study concluded that RA could be prevented by following a balanced diet and by creating awareness on the same.

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INTRODUCTION

Across the globe, the number of deaths due to tobacco and nicotine consumption rises to one-fifth of the general population (Johnson, 2020). The most common form of tobacco consumption is practised by smoking (Sekar, 2019). Smoking refers to the inhalation of tobacco vapours from pipes or cigars either through the oral cavity or through direct inhalation of the vapours (Seppan *et al.*, 2018). The use of tobacco most commonly leads to diseases such as heart and lung cancer, strokes, heart attacks, pulmonary diseases and emphysema apart from other hereditary diseases (Krishna and Babu, 2016). Apart from smoking one of the significant factors that affect the mental and physical health of an individual date back to the concept of obesity (Nandhini *et al.*, 2018). Obesity is a common yet preventable disease which is non-communicable (Subashri and Thenmozhi, 2016). It occurs due to the abnormal or excess deposition and accumulation

of fat in the adipose tissues leading to a puffed-up appearance (Thejeswar and Thenmozhi, 2015). The fat generally accumulates in the peripheral parts of the body, and this accumulation relates to the risk of various diseases such as type-2 diabetes, COPD and other deadly conditions (Ofei, 2005). Rheumatoid arthritis or commonly called RA is a common chronic inflammatory disease that causes inflammation of joints on both sides of the body leading to a decrease in the immune response of the body (Sriram et al., 2015). A person with inflammatory joints passes several stages before reaching its peak (Keerthana and Thenmozhi, 2016). The first phase represents the start or onset of rheumatoid arthritis. The second phase usually determines if rheumatoid arthritis shall persist or perish. The third and fourth stages typically determine the type of RA that the person shall develop based on the lifestyle features and symptoms (Heidari, 2011).

The association between the occurrence of rheumatoid arthritis and age varies with the extent of smoking. Smokers are prone to develop rheumatoid arthritis after 20 years of smoking, or in other words, smokers with greater than or equal to 25 packets of cigarettes a month are more susceptible to rheumatoid arthritis (Saag et al., 1997). The exposure to various environmental factors increases the risk of rheumatoid arthritis in smokers predominantly in East Indian areas depending on four significant elements, namely joint involvement, serology, duration of the symptom and acute phase reactants (Pratha and Thenmozhi, 2016). This criterion applies to any patient who shows even one of the above symptoms (Menon and Thenmozhi, 2016). This new identification modality helps in early diagnosis and treatment of rheumatoid arthritis, thereby preventing and minimising the loss of deaths due to the same (Okada, 2014). In association with obesity, 18% of RA patients were recorded as obese (Samuel and Thenmozhi, 2015). The basal metabolic rate does not signify an accurate measure, but metabolic alterations help in the reduction of fat-free measures without bringing about any change in body weight (Stavropoulos-Kalinoglou et al., 2011). On comparing age with the occurrence of rheumatoid arthritis, people falling in the category of 30-50 years of age suffer from an increased risk of occurrence of RA. previous researches suggested that people aged 18-44 years were less susceptible to this disease with a total of 7.1% of the population affected (Patel and Bhadoriya, 2011).

Despite the advancing technologies, the awareness and spread of rheumatoid arthritis remain limited only to educated individuals, and the number of deaths due to this disease should be brought under
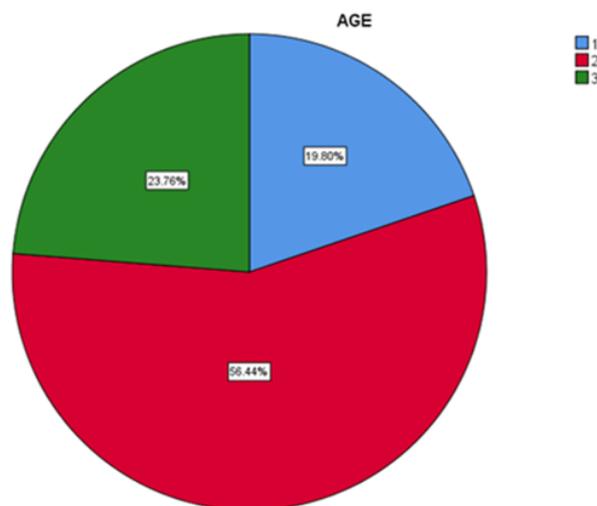

Figure 1: Piechart showing the frequency distribution of age of the participants
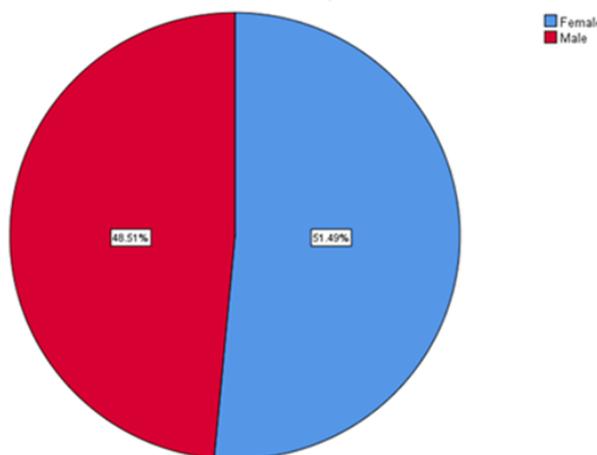

Figure 2: Pie chart showing the frequency distribution of gender of survey participants
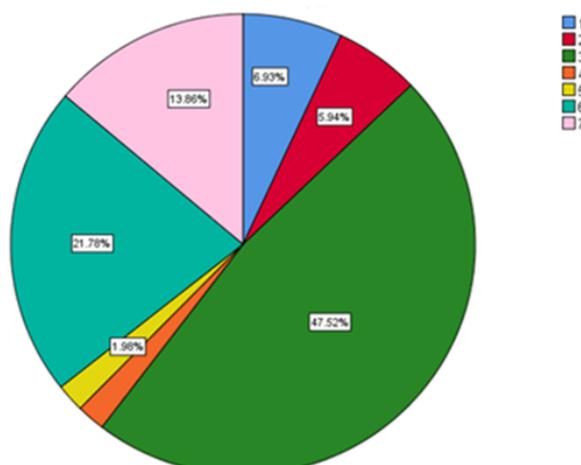

Figure 3: Pie chart showing frequency distribution of occupation of all the survey participants
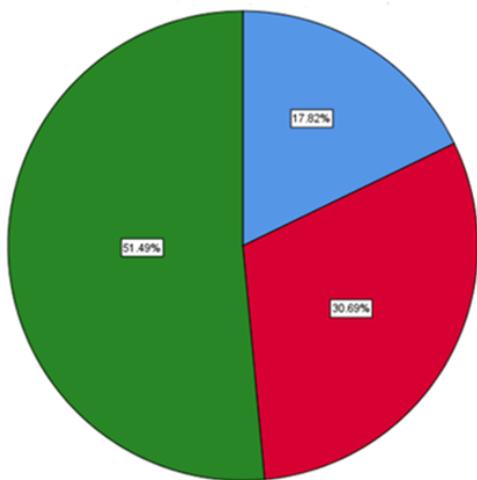
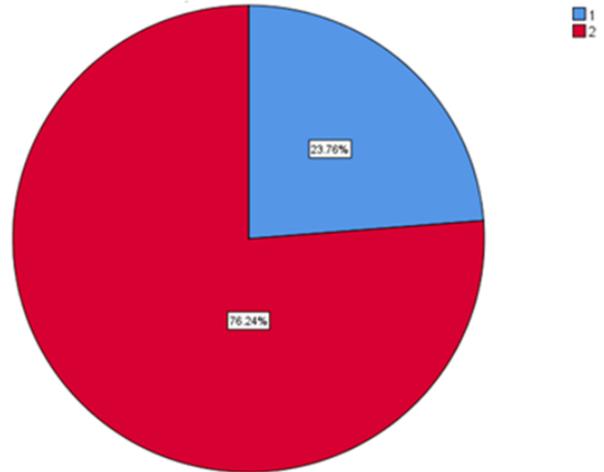**Figure 4: Pie chart showing descriptive analysis of awareness of RA**

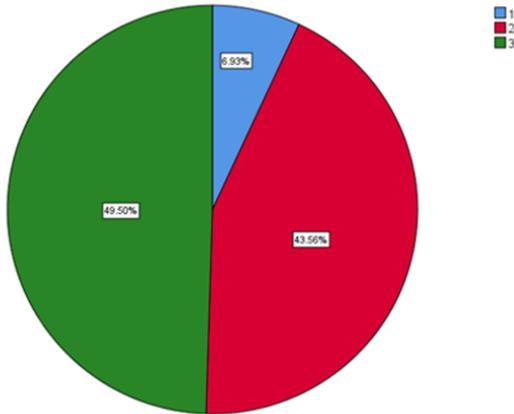**Figure 7: Pie chart showing descriptive analysis of whether nicotine affects RA**

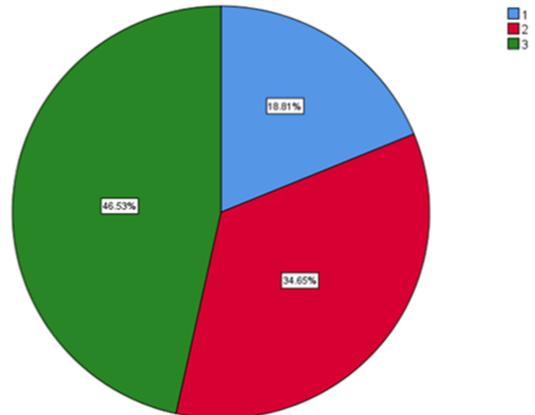**Figure 5: Pie chart showing descriptive analysis of type of disorder of RA**

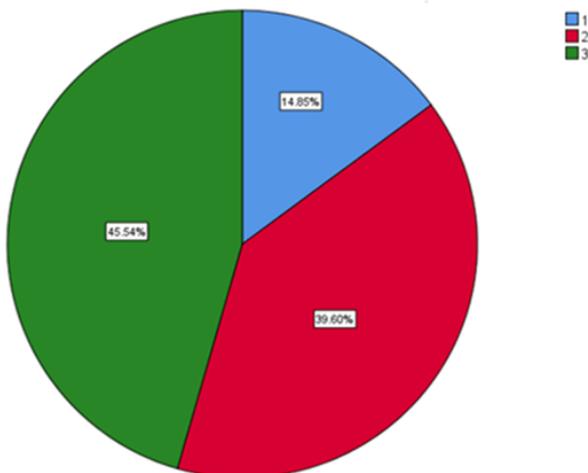**Figure 8: Pie chart showing descriptive analysis of occurrence of RA in smokers**

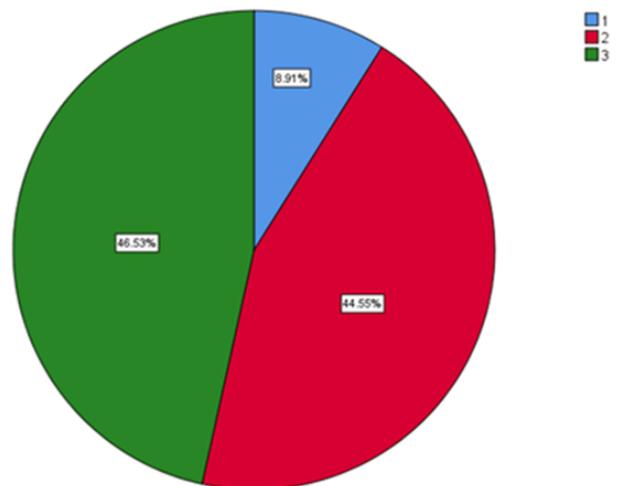**Figure 6: Pie chart showing descriptive analysis of susceptibility to RA**

Figure 9: Pie chart showing descriptive analysis of relevance of obesity and RA
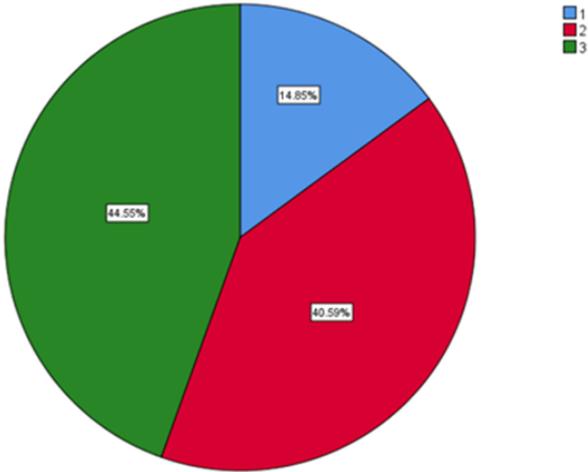
Figure 10: Pie chart showing descriptive analysis of factor in obesity and relation to RA

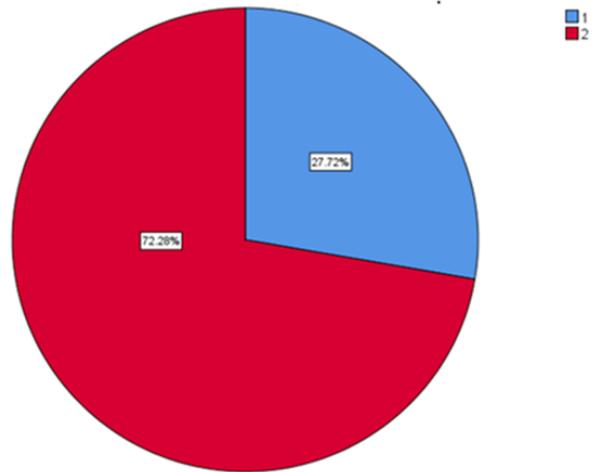**Figure 13: Pie chart showing descriptive analysis of exercise in preventing RA**
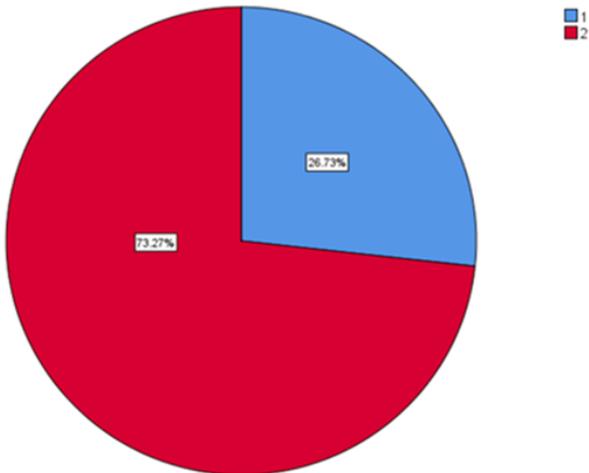

Figure 11: Pie chart showing descriptive analysis of relevance of sex hormones and RA
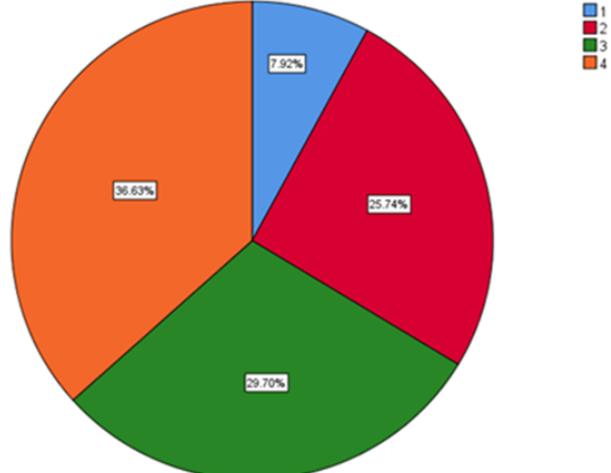

Figure 14: Pie chart descriptive analysis of treatment modalities of RA
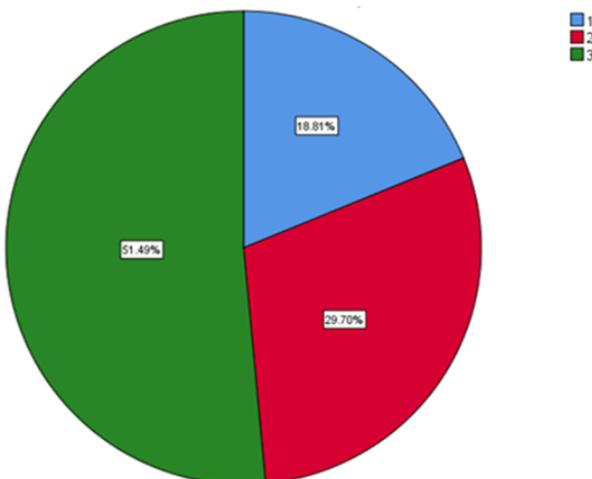
Figure 12: Descriptive analysis of relation between oestrogen and RA
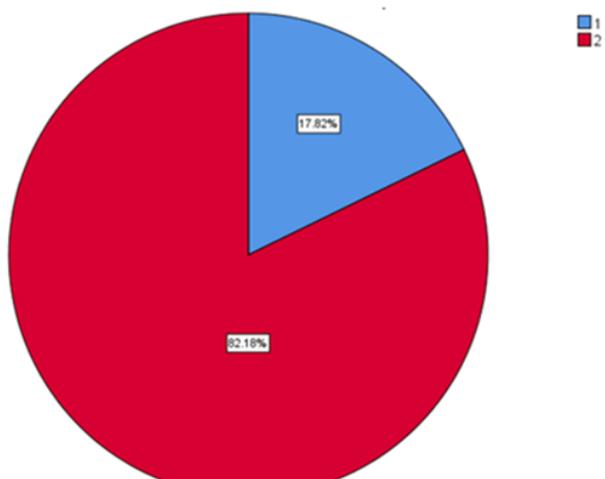
Figure 15: Pie chart showing descriptive analysis of need to spread awareness on RA
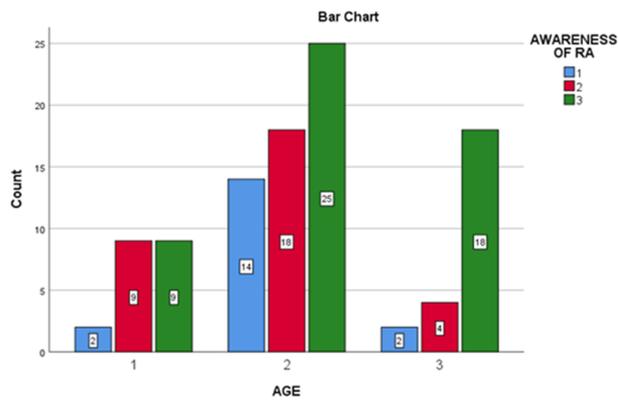
Figure 16: Bar graph showing association between age and awareness on Rheumatoid arthritis

Figure 17: Bar graph showing association between age and type of disorder of RA

Figure 18: Bar graph showing association between age and susceptibility to RA

Figure 19: Bar graph showing association between age and nicotine exposure

Figure 20: Bar graph showing association between age and development of RA in smokers
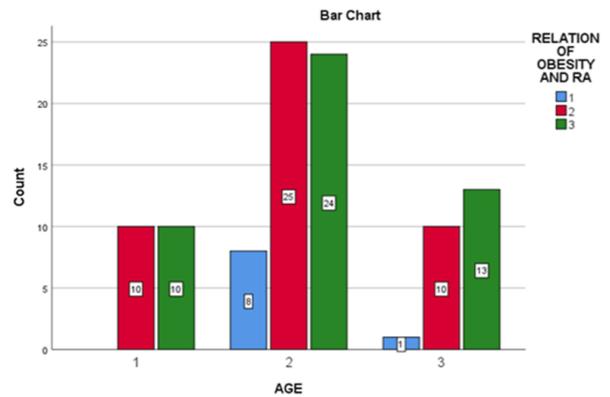
Figure 21: Bar graph showing association between age and relation of obesity with RA

control. The name of this research is to analyse the relationship between age, gender, obesity and smoking with rheumatoid arthritis and to determine the need to spread awareness about the same among the middle and old aged population.

Figure 22: Bar graph showing association between age and factor in obesity that causes RA

Figure 23: Bar graph showing association between age and relevance of sex hormones to RA

Figure 24: Bar graph showing association between age and effect of oestrogen on R

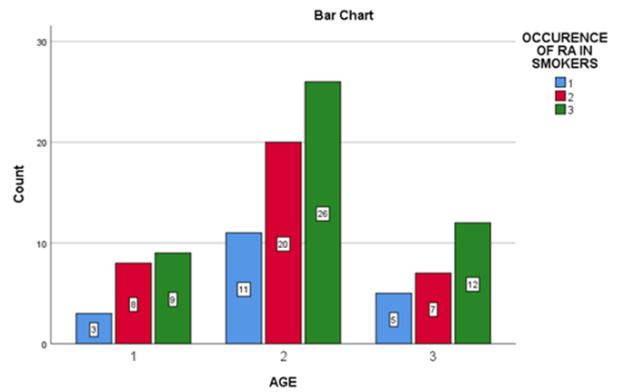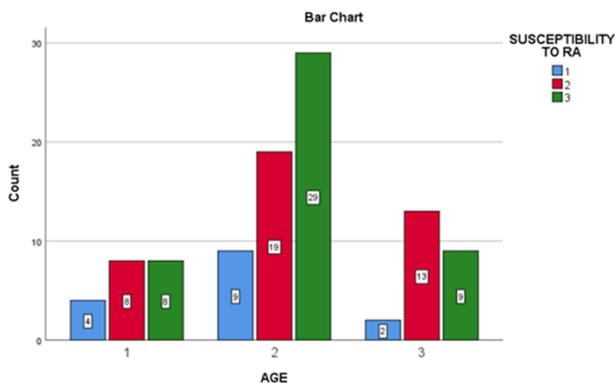**Figure 25: Bar graph showing association between age, exercise and RA**

Figure 26: Bar graph showing association between age and treatment of RA

Figure 27: Bar graph showing association between age and awareness among participants on RA
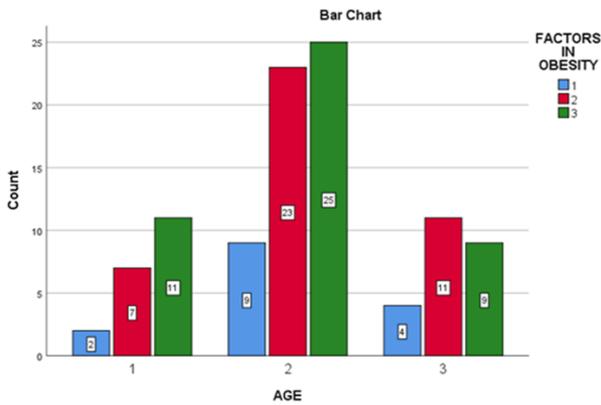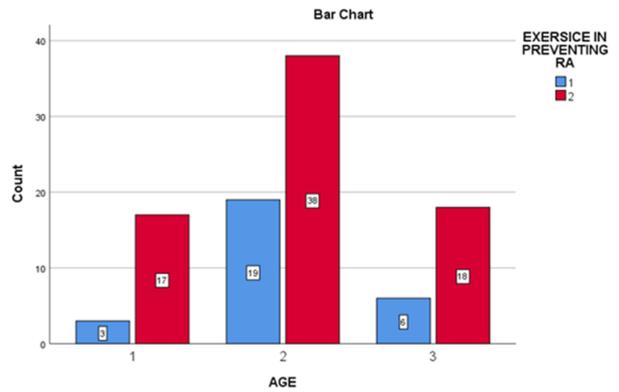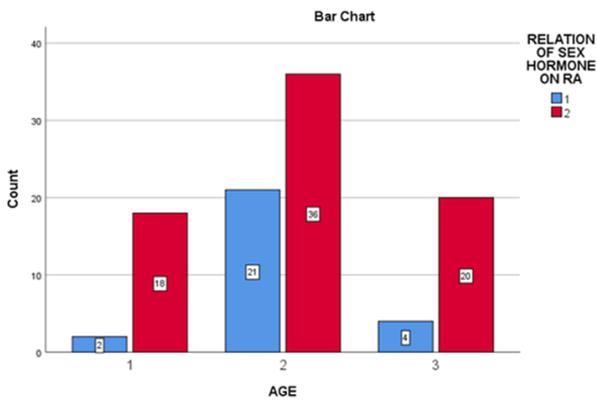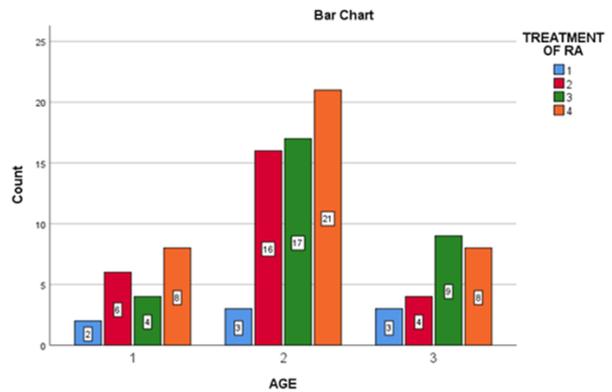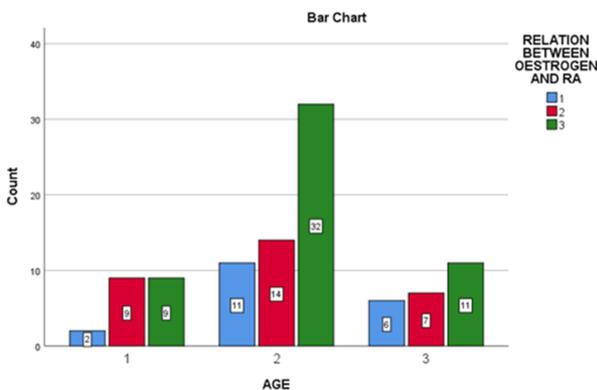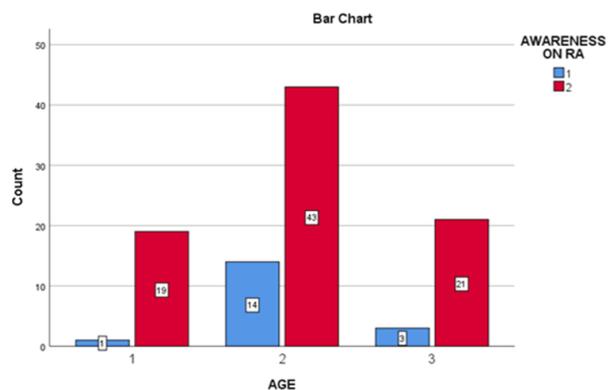
MATERIALS AND METHODS

The present study has been conducted through an online setting among the middle and old aged population in Chennai city. The institutional review board had obtained the research approval, and no human and ethical approval was necessary. The present study involved two principal individuals, namely the primary investigator and the guide.

The present study involved a sample size of 100 participants and the questionnaire prepared was circulated through an online Google forms link and the sampling method that was suggested was a simple random sampling. For the present study, the measures taken to minimise the bias was randomisation which included all the variables. The internal validity of the study included the pretesting of the questionnaire. In contrast, the external validity included the homogenisation and replication of experiment along with the cross verification with already existing studies.

The statistical test performed was the student's unpaired 'T' test, and the statistical software used what's the SPSS version 22.0. In the present study, the independent variables included are education, food habits and occupation, whereas the dependent variables included are age, gender, duration of smoking and obesity of the individuals. Chi-square test was used for statistical analysis for the association.

RESULTS AND DISCUSSION

In the survey study, the age of the participants was grouped into young adult, middle-aged and old age. The ages ranging from 25-35 were 19.80%, 35-45 were 56.44%, and above 45 were about 23.76% (Figure 1). Age grouped from 25-35 were 19.80% (blue colour), 35-45 were 56.44% (red colour) and above 45 were about 23.76% (green colour).

In the present study, the percentage of females who attended the questionnaire was 51.5%, and the rate of males included was 48.5% (Figure 2), which females were 51.49% (blue colour) and males were 48.51% (red colour).

The occupation of the survey participants is 6.93% were auditors, 5.94% were doing business, 47.52% were dentists, 1.96% were college students (above undergraduate level), 21.76% were housewives, and 13.86% were teachers (Figure 3). where 6.93% (blue colour) - auditor, 5.94% (redcolour) - business, 47.52% (green colour) - dentist, 1.96% (yellow colour) -college students, 21.76% (light blue colour) - housewife, 13.86% (pink colour)- teacher.

The survey participants responded that the causes for RA were due to many factors. 17.82% of the population responded that RA occurs due to defects in blood supply to skeletal components, 30.69% said that it was due to weakening of bones and tissues and 51.49% responded it was due to inflammation of joints (Figure 4). where 17.82% (blue colour) - Defect in blood supply to skeletal components, 30.69% (red colour) - Weakening of bones and tissues and 51.49% (green colour) - Inflammation of joints

The percentage of people opting for the type of disease that rheumatoid arthritis is. 6.9% felt that rheumatoid arthritis is an infectious disease; 43.6% voted for auto-immune disease and 49.6% for systemic disease (Figure 5). where 6.39% (blue colour)-infectious disease, 43.56% (red colour)-systemic disease and 49.56% (green colour)- auto-immune disease.

14.9% felt that children are most affected by RA, 39.6% voted for men, while 45.5% opted for women (Figure 6). where 14.85% (blue colour)-children, 39.60% (red colour)- women and 45.54% (green colour)- men

Similar results were provided by Patel, P. K. and Bhadoriya, U. 2011 with 52.8%.

Figure 7 represents that 23.8% were aware of the relation of rheumatoid arthritis and nicotine, while 76.2% were unaware. Similar results were provided by (Kvien, 2006), with 95% awareness rate. where 23.76% (blue colour)-No and 76.24% (red colour)-Yes

Figure 8 represents the people having RA and has the habit of smoking. Subjects having RA with the number of years of smoking were 34.7% for 10 to 15 years of smoking, 46.5% for 16 to 20 years and 18.8% for greater than 20 years. Similar results were provided by (Protogerou, 2013) with 56.2%. where 18.81% (blue colour)->2 years, 34.65% (red colour)-16-20 years and 46.53% (green colour)- 10-15 years.

Figure 9 shows that 8.9% felt that obesity does not affect rheumatoid arthritis. 46.5% but obesity increases the risk of rheumatoid arthritis and 44.6% but decreases the risk. where 8.91% (blue colour)-does not affect, 44.55% (red colour)- decreases the risk and 46.53% (green colour)- increases the risk.

Similar results were provided by (Protogerou, 2013) with 29.06% (Protogerou, 2013; Hafeez and Thenmozhi, 2016).Figure 10 represents 40.6% shows an increase in inflammatory cytokines as a trigger factor in obesity for rheumatoid arthritis, 44.6% increase in adipose tissues and 14.9% for

both. where 14.85% (blue colour)- both, 40.59% (red colour)- Increase in inflammatory cytokines and44.55% (green colour)- Increase in adipose tissue.

Similar results were provided by (Neame and Hammond, 2005) with 22.5% increase in inflammatory cytokines.

26.7% disagreed that sex hormones affect rheumatoid arthritis and 73.3% of sex hormones affect rheumatoid arthritis. Similar results were provided by (Neame and Hammond, 2005), with 86.9% agreeing with rates (Figure 11). where 26.73% (blue colour)- no, 73.27% (red colour)- yes.

Figure 12 shows that 29.7% felt that oestrogen increases the onset of rheumatoid arthritis, 51.5% that decreases and 18.8% that does not affect. Similar results were provided by (Cutolo, 2002) with 95%. where 18.81% (blue colour)- not sure, 29.7%(red colour)-decreases risk of RA and 51.49% (green colour)- increases risk of RA

Figure 13 shows that 29.7% disagrees that exercise can prevent rheumatoid arthritis and 72.3% that it can avoid. where 27.72% (blue colour)-no, 72.28% (red colour)- yes.

(Patel and Bhadoriya, 2011) obtained similar results et al. with 65% agreeing that exercise can prevent rheumatoid arthritis (Patel and Bhadoriya, 2011; Choudhari and Thenmozhi, 2016).

Figure 14 shows that 25.7% felt surgeries could be used to treat rheumatoid arthritis 29.7% buy a specific exercise and 36.6% diet rich in fish liver and cod liver oil, 7.9% by all of the above methods (Hewitt, 2013; Kannan and Thenmozhi, 2016). where 7.92% (blue colour)- all, 25.74% (red colour)- surgeries, 29.7% (green colour)- diet rich in fish liver and cod liver oil, 36.63% (orange colour)- specific exercises.

Figure 15 shows that 17.8% disagrees that awareness of rheumatoid arthritis is essential, while 82.8% awareness is required. where 17.82% (blue colour)- no, 82.18% (red colour)- yes.

Similar results were provided by (Hewitt, 2013) with 80% agreeing that knowledge of rheumatoid arthritis is critical (Hewitt, 2013).

Twenty-five participants aged 35-45 and 32 participants of the same age group were aware that rheumatoid arthritis was due to inflammation of joints, and it is an auto-immune disorder, respectively. It was found that there was an association between age and awareness on RA, where Chi-square test showed p=0.047 indicating statistically significant (p<0.05) (Figure 16). X-axis represents age and y-axis represents the number of participants responded.

Also, it was found that there was no association between age and type of disorders of RA, where Chi-square test showed p=0.211 indicating statistically not significant (p>0.05) (Figure 17). X-axis represents age and y-axis represents the number of participants responded.

From the present study, it was observed that there was no association between age and susceptibility to RA, where Chi-square test showed p=0.439 indicating statistically not significant (p>0.05) (Figure 18), (Kvien, 2006). X-axis represents age and y-axis represents the number of participants responded.

Also, it was found from this survey study that there was an association between age and nicotine exposure, Chi-square test showed p=0.032 indicating statistically significant (p<0.05) (Figure 19). X-axis represents age and y-axis represents the number of participants responded.

Thirty-eight participants of the age group 35-45 were aware of the effects of nicotine and the occurrence of RA in smokers (Heidari, 2011). Thus, this showed that there was an association between age and development of RA in smokers, where Chi-square test showed p=0.955 indicating statistically significant (p<0.05) (Figure 20). X-axis represents age and y-axis represents the number of participants responded.

From the survey analysis, it was observed that there was no association between age and relation of obesity with RA, where Chi-square test showed p=0.304 indicating statistically not significant (p>0.05) (Figure 21). X-axis represents age and y-axis represents the number of participants responded.

It was found that there was no association between age and factor in obesity that causes RA, where Chi-square test showed p=0.829 indicating statistically not significant (p>0.05) (Figure 22). X-axis represents age and y-axis represents the number of participants responded.

From the data, it was found that there exists an association between age and relevance of sex hormones to RA, where Chi-square test showed p=0.029 indicating statistically significant (p<0.05) (Figure 23). X-axis represents age and y-axis represents the number of participants responded.

The data showed that there was no association between age and effect of oestrogen on RA; Chi-square test showed p=0.412 indicating statistically not significant (p>0.05) (Figure 24). X-axis represents age and y-axis represents the number of participants responded.

It was found that there was no association between

age, exercise and RA, where Chi-square test showed p=0.273 indicating statistically not significant (p>0.05) (Figure 25). X-axis represents age and y-axis represents the number of participants responded.

From the present survey study, it was found that there was no association between age and treatment of RA, where Chi-square test showed p=0.739 indicating statistically not significant (p>0.05) (Figure 26). X-axis represents age and y-axis represents the number of participants responded.

Also, it was found that there was no association between age and awareness among participants on RA. Chi-square test showed p=0.107 indicating statistically insignificant (p>0.05) (Figure 27). X-axis represents age and y-axis represents the number of participants responded.

Thus, it is inferred from the survey analysis that there was not much awareness on the effects of RA and its long term consequences among the people and this necessitates for spreading the consciousness, a piece of general and medical knowledge on RA among all age groups. The data obtained from the present study prove to be similar to the previous research studies conducted on similar fields of RA, and the percentage obtained for each question matches the percentage obtained by previous studies. Thus, the survey serves as evidence and adds to the consensus that there is an association between gender, age, obesity and smoking with rheumatoid arthritis and can be utilised for further clinical studies. Limitations of the study included small sample size, homogenous population and restriction to a geographically local region.

CONCLUSION

Rheumatoid arthritis can be prevented by a healthy, balanced diet, regular exercise and a change in lifestyle and habitat. Spread of awareness concerning RA and its effective treatment modalities among the middle-aged and elderly population can decrease the risk of RA and therefore enhance the quality of life. Thus, within the limitations of this study, we conclude that there was an association between rheumatoid arthritis with gender, age, obesity and smoking condition among the middle-aged and old aged population. But the awareness about the effects of RA and its long term consequences among the people remains sparse and need to be improved by educational and several regulatory interventional strategies among the people of all ages.

Funding support

Conflict of Interest

The authors declare that they have no conflict of interest.

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