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Prevalence of Dental Attrition among Rice Mill Workers & Gingelly Oil Mill Workers- An Observational study

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Abstract

Aim: The aim of the study is to find prevalence of dental attrition among rice mill workers and gingelly oil mill workers.

Methodology: The study was conducted in Rice Mills & Gingelly oil mills in outskirts of Kangeyam. The prevalence rate from the pilot study was used to calculate the sample size. Sample size - 230 (115 rice mill workers and 115 gingelly oil mill workers).

All the examinations were carried out by a single operator under good illumination using sterile diagnostic instruments and loupes. Intraoral examination was proceeded in an orderly manner starting from upper right quadrant to lower right quadrant in a clockwise direction, to evaluate the attrition using attrition index given by Smith and Knight in 1984. Descriptive statistics was obtained.

Outcome: More prevalence of attrition is among rice mill workers than gingelly oil mill workers.

Keywords: Attrition, Habitual grinding, Rice mills

Introduction

The major oral health problem that adversely affects tooth structure and is extensively studied is caries. While adequate attention has been given to identifying the causes of dental tissue changes, such as dental caries and trauma, tooth wear has often been overlooked. Tooth wear is the progressive loss of dental hard tissues from the surfaces of the teeth, resulting from relative motion or friction at the surface [1,2]. It can be attrition, abrasion, erosion or abfraction [3]. Tooth wear attributed to masticatory function is commonly regarded as a natural phenomenon, with a certain degree of wear considered to be an inevitable aspect of aging [4]. However, when the extent of destruction or rate of loss exceeds the physiological mechanisms of compensation, such as the formation of secondary dentin, dental problems may arise, necessitating treatment [5]. It may cause functional and esthetic problems and dental sensitivity [1], or it could prejudice the survival of the teeth [2]. Wear could be critically pathological when it leads to poor masticatory function with concomitant reduction in quality of life and possible deterioration of systemic health [6].

Moreover, there is no consensus on exact prevalence of attrition. It's an issue that should not be ignored, and further research is needed to establish clear assessment criteria [1,2]. Previous pieces of literature estimated prevalence of dental attrition in Indian population, focusing on age and gender [7,8]. Given rice's status as a staple food for the majority of the Indian population, particularly in South India, rice mills are concentrated in these areas. During work hours, employees may engage in habitual grinding of rice,

which can have a detrimental effect on their teeth, such as attrition. Consequently, this study aims to determine the prevalence of dental attrition among workers in both rice mills and gingelly oil mills.

Materials & Methods:

This is a cross-sectional study conducted among rice mill and gingelly oil mill workers of Kangeyam district of Tamil Nadu. The workers aged 18-60 years with an experience of at least one year, and willing to participate in the study were included. Presence of all permanent teeth and/or two to three missing teeth in posterior and/or anterior region was the inclusion criteria. Patients with any systemic illness, four or more posterior teeth missing in anterior/posterior region, patients with extensive restorations, cast restorations or cuspal coverage and those who have undergone orthodontic treatment, presence of fixed or removable prosthesis or with fluorosed teeth were excluded from the study. Age, gender, work experience and frequency of rice grinding were obtained using a pre-validated questionnaire. All the oral examinations were carried out among study participants by the primary investigator and Smith and Knight tooth wear index (1984) was used to quantify tooth attrition.

The data were analyzed using SPSS version 25.0 (Statistical Package for Social Sciences, IBM, USA Inc.). Descriptive statistics were performed to obtain frequencies, means and standard deviations. Independent t-test was performed for comparison of the attrition scores between Groups 1 and 2. Pearson's correlation coefficient was used to find the correlation between frequency of rice grinding and attrition scores. One-way ANOVA was used to compare the attrition scores among different age groups and work experiences. The level of significance was kept at $p<0.05$.

Results:

The study participants comprised 230 individuals with 115 working in rice mills and 115 working in gingelly oil mills. The age of the participants ranged from 19 to 60 years with a mean of 38.35±12.02 years. Their work experience ranged from 1 to 35 years with a mean of 11.42±10.19 years. Their attrition scores ranged from 0 to 5.35 with a mean of 1.34±1.36. The frequency of raw rice grinding among the study participants ranged from 0 to 10 times a day with a mean of 1.74±2.48 (Table 1 and Figure 1). The male and female participants in the rice mill were 71 and 44 respectively. The male and female participants in the gingelly oil mill were 70 and 45 respectively (Table 2 and Figure 2). There were no significant differences in the distribution of sex among both groups (Table 3).

The mean age of study participants in the rice mill and the gingelly oil mill were 38.40±12.08 and 38.30±12.03 respectively. The distribution of age among both groups were equal and there were no significant differences between them. The mean attrition score among rice mill workers and gingelly oil mill workers were 1.54±1.52 and 1.14±1.16 respectively. Statistically significant differences existed in the attrition scores of rice mill and gingelly oil mill workers ($p=0.025$). The mean frequency of rice grinding habits among rice mill and gingelly oil mill workers were 3.13±2.76 and 0.36±0.95 respectively. A statistically significant difference existed in the frequency of rice grinding between both groups ($p=0.000$) (Table 4). While 49.65% of participants among rice mill workers and 21.23% among gingelly oil mill workers experience attrition, almost 68% of those affected by attrition also report sensitivity issues.

Pearson's correlation between the frequency of rice grinding habit and attrition score was 0.483 (Moderate correlation) and it was significant ($p=0.000$) (Table 4). The ages of the participants were divided into young age (18-34 years) (n=94), middle age (35-54years) (n=113), and old age (>54 years) (n=23), and their mean attrition scores were 0.54±0.86, 1.80±1.37, and 2.34±1.35 respectively. A significant difference exists in the attrition scores of different age groups. Attrition was lower among the young age group and is seen to increase with the increasing age group (Table 6 and Figure 3). Among the young age group, 45 were rice mill workers with a mean attrition score of 0.55±0.89, and 49 were gingelly oil mill workers with a mean attrition score of 0.53±0.83. There were no significant differences in their attrition scores (Table 7). Among the middle age group, 58 were rice mill workers with a mean attrition score of 2.11±1.51, and 55 were gingelly oil mill workers with a mean attrition score of 1.47±1.13. Significant differences in their attrition scores were noted (Table 8). Among the old age group, 12 were rice mill workers with a mean attrition score of 2.51±1.50, and 11 were gingelly oil mill workers with a mean attrition score of 2.16±1.20.

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There were no significant differences in their attrition scores (Table 9 and Figure 4).

The work experience of the study participants was classified into 1-5 years (n=91), 6-20 years (n=91), and >20 years (n=48), and their mean attrition scores were 0.53±0.70, 1.58±1.37, and 2.40±0.20 respectively. A significant difference in the attrition scores was noted among participants of different work experiences and is seen to increase with increasing work experience (Table 10 and Figure 5). Among workers with 1-5 years of experience, 49 were rice mill workers with a mean attrition score of 0.48±0.56, and 42 were gingelly oil mill workers with a mean attrition score of 0.59±0.84. There were no significant differences in their attrition scores (Table 11). Among workers with 6-20 years of experience, 43 were rice mill workers with a mean attrition score of 2.01±1.47, and 48 were gingelly oil mill workers with a mean attrition score of 1.20±1.16. Significant differences in their attrition scores were noted (Table 12). Among workers with over 20 years of experience, 23 were rice mill workers with a mean attrition score of 2.92±1.16, and 25 were gingelly oil mill workers with a mean attrition score of 1.95±1.13. Significant differences in their attrition scores were noted (Table 13 and Figure 6).

Discussion:

Dental attrition, commonly known as tooth wear, is the wear of tooth enamel and/or dentin and is thought to be a physiological and aging process. However, certain habits can also cause dental wear. Although the relationship between habitual grinding of raw rice and dental attrition has not been documented previously, this study explores this different perspective. People working in rice processing mills are subjected to smelling and tasting the rice for quality checks, thus making them more prone to the habitual grinding of rice leading to tooth wear similar to tooth erosion found in certain occupations like battery-manufacturing units [9,10]. Such occupational tooth wear was reported among tailors and workers in clothing industries [11], and miner [12], but no documentation was found among rice mill workers. This study is the first of its kind to explore the dental problems faced by rice mill workers. Gingelly oil mills were predominant in the study area; hence the workers of gingelly oil mills were taken as a control group.

The rice grinding habit among rice mill workers can stem from various factors inherent to their work environment and lifestyle. Firstly, the repetitive nature of rice milling tasks, which often involve prolonged periods of grinding and processing rice grains, may lead to the development of a habitual behavior as workers become accustomed to the rhythm of their daily tasks. Overall, the possibilities of rice grinding habit among rice mill workers highlight the complex interplay of occupational, environmental, and cultural factors that influence behavior in the workplace.

The overall prevalence of tooth wear among 115 gingelly oil mill and 115 rice mill workers were 21.23% and 49.65% respectively. Among the gingelly oil mill workers, the prevalence of tooth wear was found to be greatest (19.98%) in older age group of >54 years compared to the middle and younger age groups. But among the rice mill workers, the middle (35-54 years) and older age group (>54 years) had almost an equal prevalence of tooth wear of 22.48% and 27.17% respectively. This higher prevalence at an earlier age of rice mill workers could be associated with the occupation of grinding of raw rice.

A study conducted by **Hegde MN et al., (2017)** [14] found a total prevalence of 40.6% among age group in the west coastal Indian population of Mangalore. They also found that attrition was greatest in the older age group. Many studies conducted across the globe found similar results of higher attrition scores among the elderly population. **Al-Zarea et al.,**[15] found 75% attrition among the representative sample of Saudi adults and found a significant correlation between age and attrition levels. Unlike the current study, none of these studies considered additional factors such as parafunctional habits or occupational and habitual practices that could contribute to the increased attrition rate among the middle-aged population.

Moreover, the current study found that 68% of participants with attrition also experienced tooth sensitivity, indicating that patients were able to identify their dental health issues even though the underlying causes remained unidentified.

After 6 months the workers were seen in person to know about the importance they had given to the habit. Those people were aware of the results and they had understood the implications of tooth wear. On a positive note, they agreed to improve the habit & few people had already visited dentists for dental check-

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up. However they were unable to totally give up the habit, because grinding rice is a necessary labor activity for their bread and butter.

The limitations of the current study could be the cross-sectional design of the study. A measure to evaluate the attrition scores after a follow-up period would produce even better results and reliability. We recommend future studies exploring such deleterious effects on the dentition due to occupational factors.

Conclusion:

Rice mill workers were found to have a higher percentage of attrition in the present study. While tooth wear like attrition is considered to be an aging phenomenon, the rice mill workers have higher prevalence of attrition in both the middle and older age groups denoting a factor contributing to this increased prevalence rates. Policies and programs targeting such vulnerable population should be advocated and awareness programs targeting such occupational exposures should be initiated. Properly planned and executed programs can help in eliminating this preventable health problem. Additionally, it's important to educate this vulnerable population about different dental procedures such as dental restorations, onlays, and inlays. This knowledge will assist in preserving their dental health and preventing any additional harmful effects.

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Tables:

Table 1: Descriptives of measured variables among the study participants (N=230)

Variables	Mean±SD	Minimum	Maximum
Age	38.35±12.02	19	60
Work experience (in years)	11.42±10.19	1	35
Attrition score	1.34±1.36	0.00	5.35
Frequency of rice grinding	1.74±2.48	0	10

Table 2: Distribution of sex among the rice mill and Gingelly oil mill workers

	Rice mill workers	Gingelly oil mill workers	Total
Male	71	70	141
Female	44	45	89
Total	115	115	230

Table 3: Comparison of sex between Groups 1 and 2

	Rice mill workers	Gingelly oil mill workers
Male	71	70
Female	44	45
X^2	0.018	
p-value	0.892	

Table 4: Comparison of means of measured variables between Groups 1 and 2

	Rice mill workers	Gingelly oil mill workers	t	p-value
Age	38.40±12.08	38.30±12.03	0.066	0.948
Work experience	11.31±10.62	11.52±9.78	-0.155	0.877
Attrition score	1.54±1.52	1.14±1.16	2.258	0.025*
Frequency of rice grinding	3.13±2.76	0.36±0.95	10.201	0.000*

*p<0.05, Significant

Table 5: Correlation between frequency of rice grinding and attrition score among study participants

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	Mean± SD	r	p-value
Attrition score	1.34±1.36	0.483	0.000*
Frequency of rice grinding	1.74±2.48		

*p<0.05, Significant

Table 6: Comparison of attrition scores among different age groups

	n	Mean±SD	95% CI	F	p-value
Young age (18-34 years)	94	0.54±0.86	0.37-0.72	38.051	0.000*
Middle age (35-54 years)	113	1.80±1.37	1.54-2.05		
Old age (55 years and above)	23	2.34±1.35	1.76-2.92		

Table 7: Comparison of attrition scores among young age group between Groups 1 and 2

Groups	Young Age			
	n	Mean±SD	t	p-value
Group 1	45	0.55±0.89	0.077	0.939
Group 2	49	0.53±0.83		

Table 8: Comparison of attrition scores among middle age group between Groups 1 and 2

Groups	Middle Age			
	n	Mean±SD	t	p-value
Group 1	58	2.11±1.51	2.529	0.013*
Group 2	55	1.47±1.13		

Table 9: Comparison of attrition scores among old age group between Groups 1 and 2

Groups	Old Age			
	n	Mean±SD	t	p-value
Group 1	12	2.51±1.50	0.622	0.541
Group 2	11	2.16±1.20		

Table 10: Comparison of attrition scores based on work experience

Work Experience	n	Mean±SD	95% CI	F	p-value
1-5 years	91	0.53±0.70	0.38-0.68	44.735	0.000*
6-20 years	91	1.58±1.37	1.30-1.86		
>20 years	48	2.40±0.20	2.01-2.82		

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Table 11: Comparison of attrition scores among workers with 1-5 years experience between Groups 1 and 2

Groups	1-5 years experience			
	n	Mean±SD	t	p-value
Group 1	49	0.48±0.56	-0.702	0.485
Group 2	42	0.59±0.84		

Table 12: Comparison of attrition scores among workers with 6-20 years experience between Groups 1 and 2

Groups	6-20 years experience			
	n	Mean±SD	t	p-value
Group 1	43	2.01±1.47	2.929	0.004*
Group 2	48	1.20±1.16		

Table 13: Comparison of attrition scores among workers with 6-20 years experience between Groups 1 and 2

Groups	6-20 years experience			
	n	Mean±SD	t	p-value
Group 1	23	2.92±1.16	2.536	0.015*
Group 2	25	1.95±1.13		

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Smith & Knight Tooth Wear Index:

Score	Surface	Criteria
0	B/L/O/I	No loss of enamel surface characteristics
	C	No change in contour
1	B/L/O/I	Loss of enamel characteristics
	C	Minimal loss of contour
2	B/L/O	Loss of enamel exposing dentine for less than 1/3 of the surface
	I	Loss of enamel just exposing dentine
	C	Defect less than 1mm deep
3	B/L/O	Loss of enamel exposing dentine for more than 1/3 of the surface
	I	Loss of enamel and substantial loss of dentine but not exposing the pulp or secondary dentine
	C	Defect 1 - 2mm deep
4	B/L/O	Complete loss of enamel or pulp exposure of secondary dentine
	I	Pulp exposure or exposure of secondary dentine
	C	Defect more than 2mm deep or pulp exposure or exposure of secondary dentine

Questionnaires:

Serial No: Examination Date:

வரிசை எண்: ஆய்வு தேதி:

1. Name:
   பெயர்:
2. Age :
   வயது:
3. Gender (M/F) :
   பாலினம் (ஆ/பெ):
4. Education:
   1) No formal education 2)Primary Education
   3) Secondary education 4) P.U.C 5)Degree
   கல்வி தகுதி
   அ) முறையான கல்வி பயிலாதவர்
   ஆ) ஆரம்பக் கல்வி இ) நடுநிலைக் கல்வி
   ஈ) பி .யு .சி உ) பட்டப்படிப்பு
5. Working hours per day :
   ஒருநாளைய வேலை நேரம்
6. Monthly income :
   மாத வருமானம்
7. Working experience :
   வேலை அனுபவ ஆண்டு
8. Diet : 1)Vegetarian 2)Mixed

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உணவுப்பழக்கம்: அ) சைவம்

ஆ) கலப்பு உணவு

9. Do you eat sweets : Yes / No
If yes, How many times in a day?
Once a day / Twice a day / Thrice a day or more
நீங்கள் இனிப்பு உட்கொள்வீர்களா ? ஆம் / இல்லை
ஆம் எனில் எத்தனை முறை ?
ஒரு முறை / இரண்டு முறை / மூன்று முறை அல்லது அதற்கு மேல்

10. Do you smoke ? Yes / No

புகை பிடிக்கும் பழக்கம் உள்ளதா? ஆம் / இல்லை

11. If yes, 1) What do you smoke? .....
2) How many cigarettes /beedis do you smoke in a day ? .....
3) Duration : .....

ஆம் என்றால் (அ) எந்த வகை புகை பிடிப்பீர்களா ஆ) ஒரு நாளில் எதனை சிகரெட் / பீடி புகைப்பீர்களா
இ) பழக்கத்தின் கால அளவு

12. Do you have paan / tobacco chewing habit? Yes/No

புகையிலை மெல்லும் பழக்கம் உண்டா? ஆம் / இல்லை

If yes, 1) Type : .....
2) Quantity : .....
3) Duration : .....

ஆம் என்றால்

அ) வகை

ஆ) அளவு

இ) காலா அளவு

13. Do you consume alcohol? Yes/No

மது அருந்தும் பழக்கம் உள்ளதா? ஆம்/ இல்லை

If yes, 1) Quantity : .....
2) Duration : .....

ஆம் என்றால்

அ) அளவு

ஆ) காலா அளவு

14. Oral Hygiene practices:
வாய் சுகாதார பழக்கங்கள்

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I. Type of tooth cleaning
1) Tooth brush + paste 2) Tooth brush + powder 3) Finger + paste 4) Finger + powder
4) Finger 6)Others, specify.....

பல் துலக்கும் முறை
அ) பல் துலக்கி + பற்பசை
ஆ) பல் துலக்கி + பற்பொடி
இ) கை விரல் + பற்பசை
ஈ) கை விரல் + பற்பொடி
உ) கை விரல்
ஊ)வேறு ஏதேனும், குறிப்பிடவும்.....

II. Method of brushing
1) Horizontal 2) Vertical 3) Both 4) Circular 5) Don't know

பல் துலக்கும் முறைகள்
அ) கிடைமட்டம் ஆ) செங்குத்து
இ) இரண்டும் ஈ) வட்டம்
உ) தெரியாது

III. Frequency of tooth brushing
1) Once daily 2)Twice daily 3) Thrice or more

ஒரு நாளில் எத்தனை முறை பல் துலக்குவீர்கள்

அ) தினமும் ஒரு முறை
ஆ)தினமும் இரண்டு முறை
இ)மூன்று அல்லது அதற்கு மேல்

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IV. Duration of tooth brushing
1) 1-2 min 2) 3-5 min 3) > 5 min 4) Not noticed

பல் துலக்க எடுத்துக்கொள்ளும்
கால அளவு
அ)1-2 நிமிடம் ஆ) 3-5 நிமிடம் இ) > 5 நிமிடம்
ஈ) கவனிக்கப்படவில்லை

V. Frequency of changing the tooth brush
1) 1-2 months 2) 3 months 3) 4-6 months
5) 7-12 months 5) Once flared 6) Irregular
6) Not noticed

பல் துலக்கியை எப்போது மாற்றுவீர்கள்
அ) 1-2 மாதங்களுக்கு ஒரு முறை ஆ)3 மாதங்களுக்கு ஒரு முறை இ)4-6 மாதங்களுக்கு ஒரு முறை
ஈ) 7-12 மாதங்களுக்கு ஒரு முறை
உ) பாழானா பிறகு
ஊ) ஒழுங்கற்ற முறை
எ) கவனிக்கப்படவில்லை

VI. Any other dental cleansing aids used, Yes / No
வேறு ஏதேனும் பல் சுத்தபடுத்தும் கருவி பயன்படுத்துவீர்களா, ஆம் / இல்லை

15. Have you visited a dentist earlier? Yes / No

நீங்கள் முன்பு பல் மருத்துவரைச் சந்தித்திருக்கிறீர்களா? ஆ ம் இல்லை

16. If yes, what was the reason?
1) Tooth ache 2) Extraction 3) Filling 4) Get teeth cleaned 5) Replacement of teeth 6) Others.....

ஆம் எனில், என்ன காரணம்?
அ) பல் வலிக்காக ஆ) பல் எடுப்பதற்காக
இ)பல் அடைபதற்காக ஈ)பல் சுத்தம் செய்ய
உ) மாற்றுப்பல் வைக்க எ)வேறு ஏதேனும்.....

17. If Not, what was the reason?
1) Lack of time 2) Dentist not available nearby 3) High cost of treatment 4) Not interested
7) Others .....

இல்லையெனில், என்ன காரணம்?
அ) நேரமின்மை ஆ) பல் மருத்துவர் அருகாமையில் இல்லை என்பதனால்
இ)செலவு அதிகமாவதால்
ஈ) விருப்பமில்லாததால் உ)வேறு ஏதேனும்.....

18. Do you have any dental problems ? Yes / No
உங்களுக்கு ஏதேனும் பல் பிரச்சனை உள்ளதா? ஆ ம்/ இல்லை

19. Do you have the habit of chewing rice? Yes/No
அரிசியை மென்று சாப்பிடும் பழக்கம் உள்ளதா? ஆ ம்/ இல்லை

20. If Yes, how many times per day?
ஆம் எனில், ஒரு நாளைக்கு எத்தனை முறை

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Figures:

Figure 1: Mean of measured variables among Groups 1 and 2

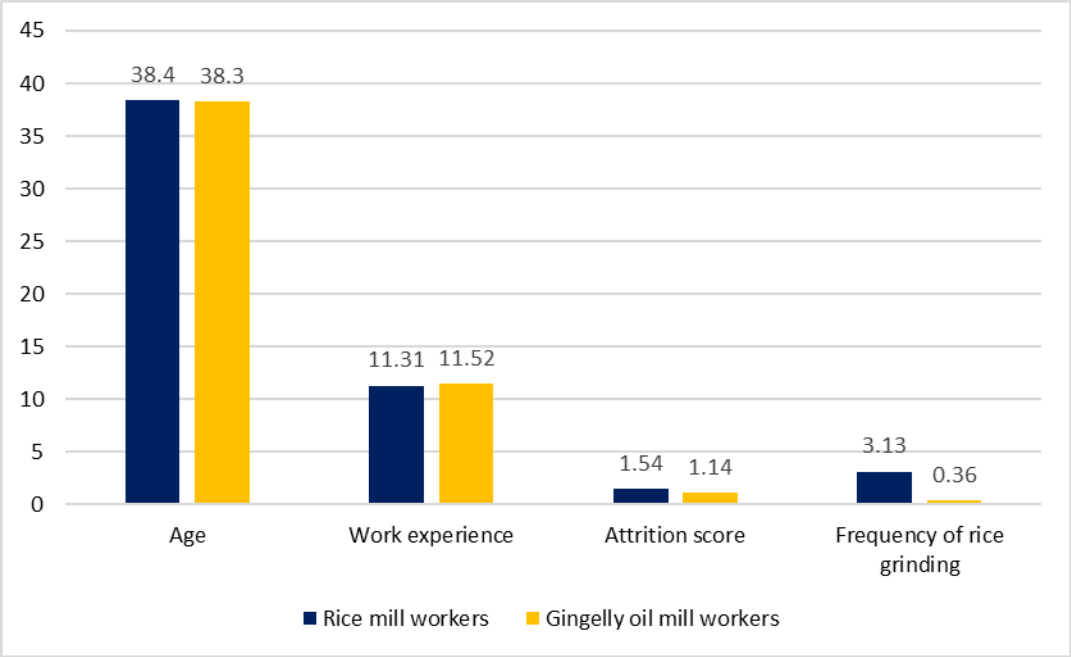

Figure 2: Distribution of sex among Groups 1 and 2.

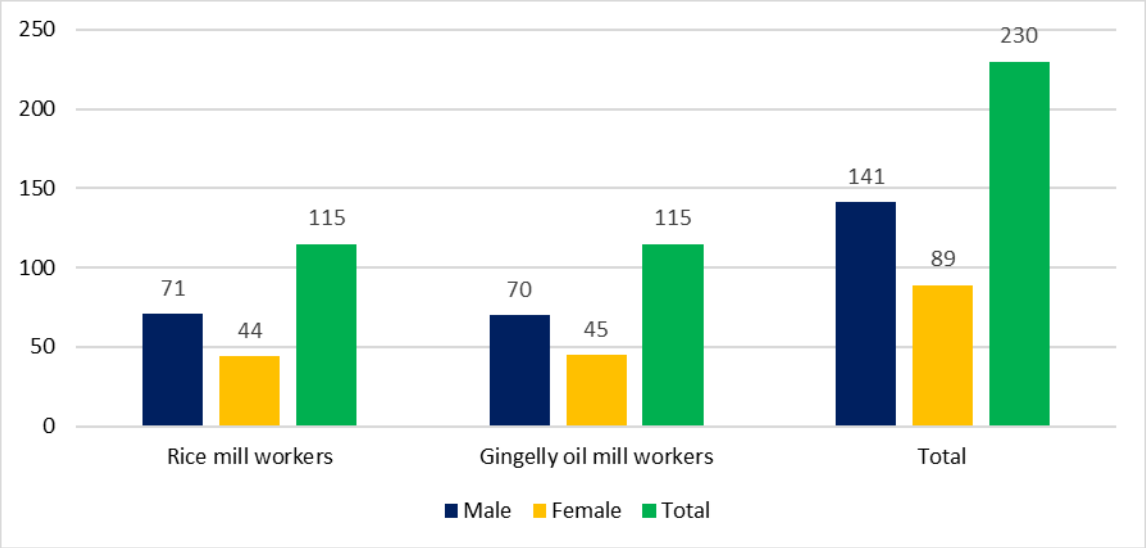

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Figure 3: Mean attrition score of different age groups

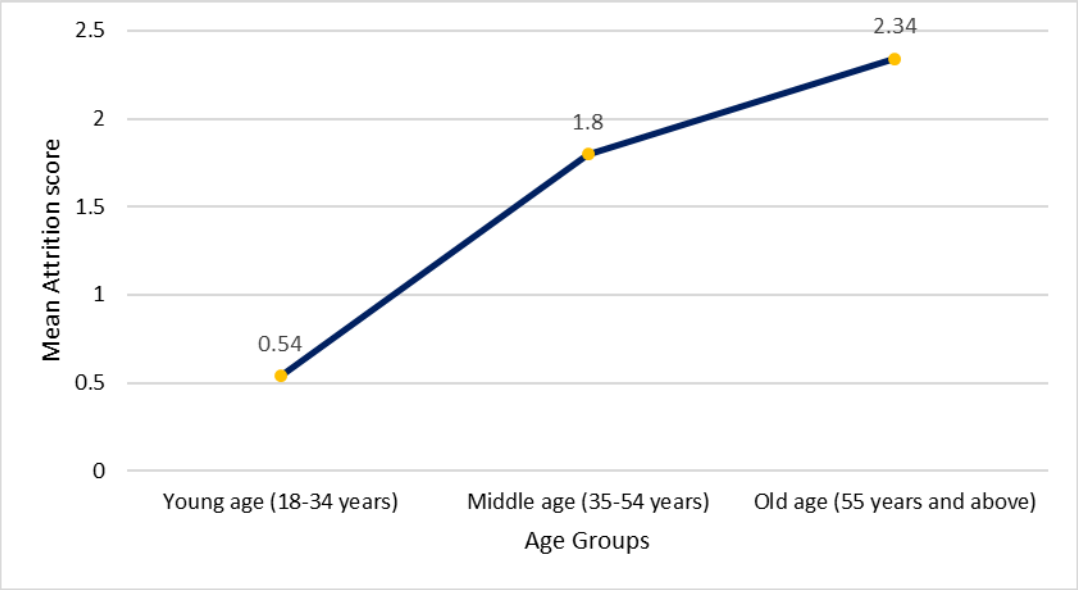

Figure 4: Comparison of attrition scores among different age groups between rice mill and gingelly oil mill workers

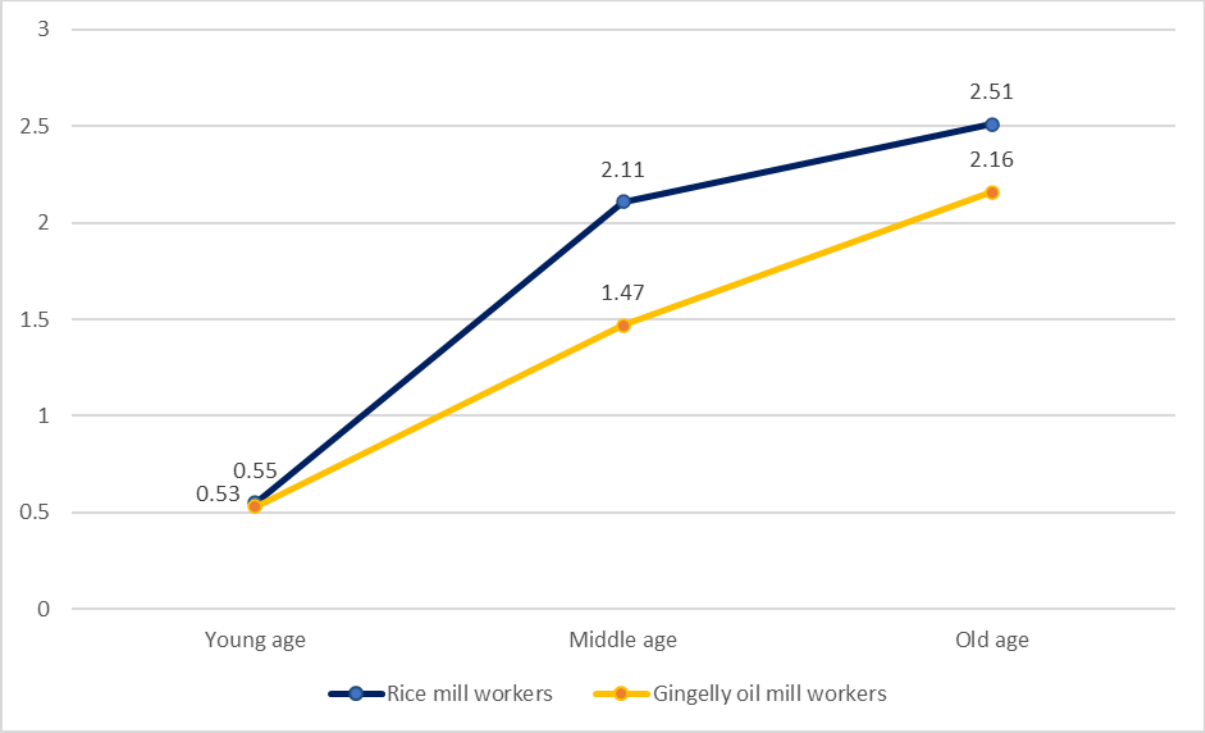

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Figure 5: Mean attrition score among the study population with differing work experiences

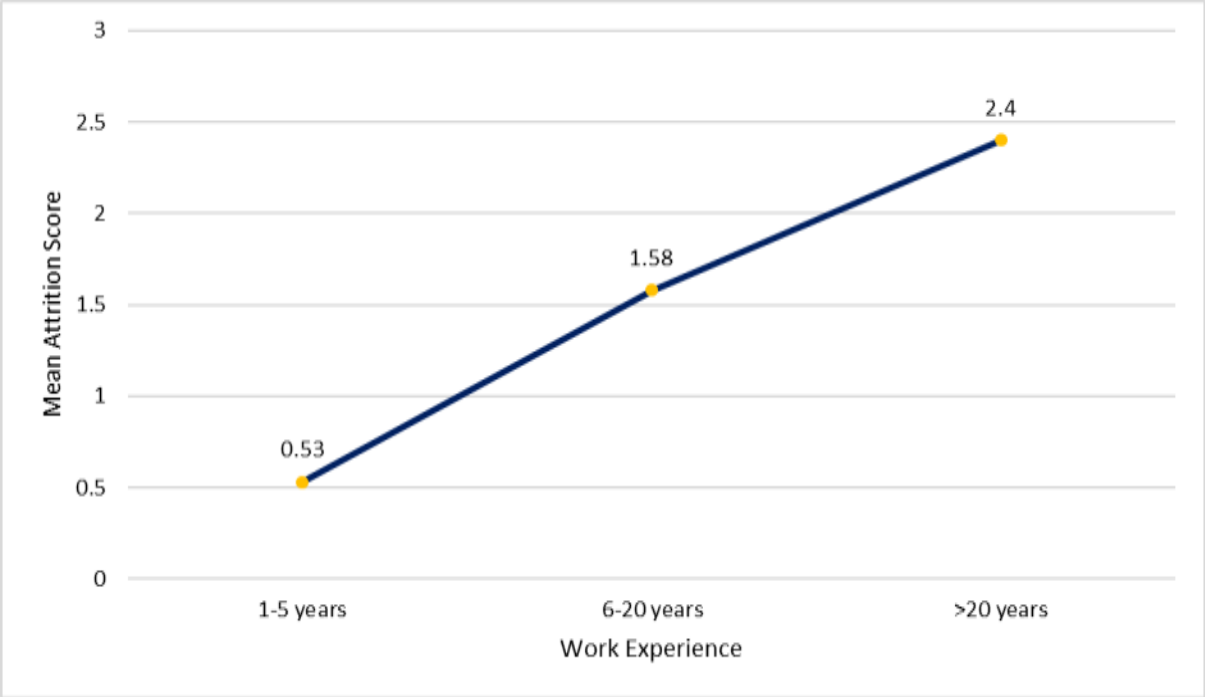
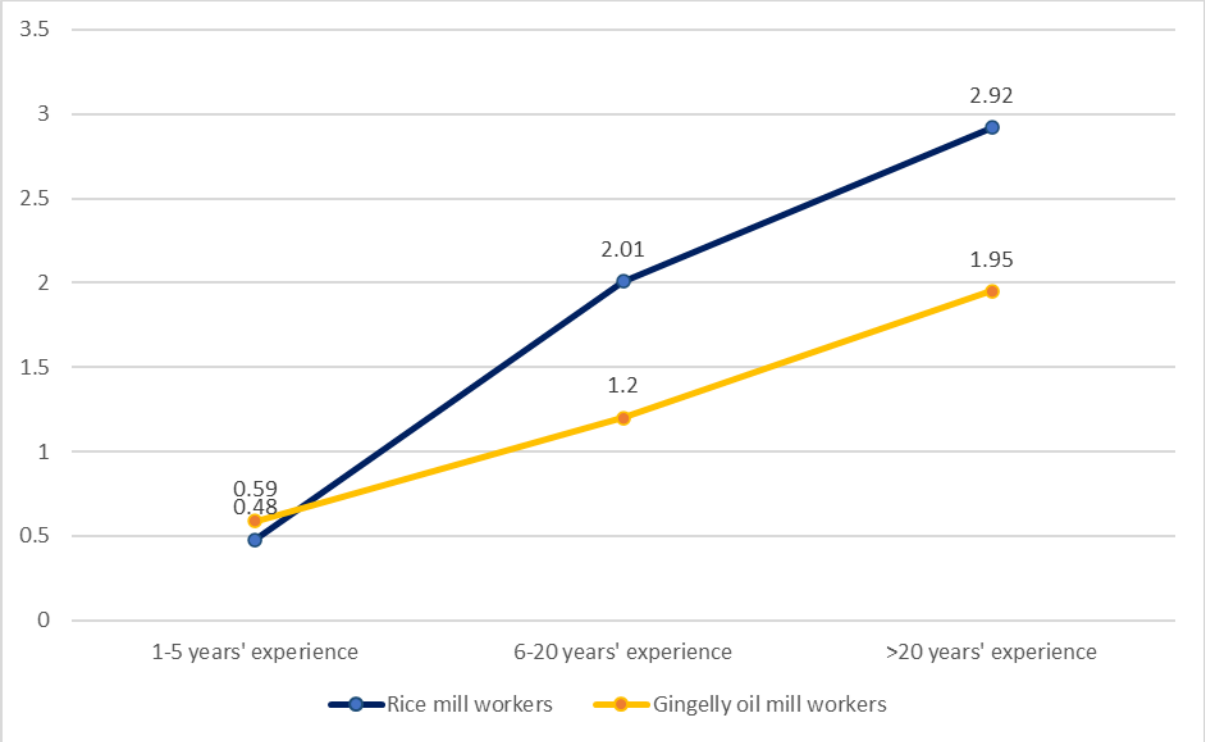


Figure 6: Comparison of attrition scores among different work experiences between rice mill and gingelly oil mill workers



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