

Investigating Health Impact on Women Due to Domestic Cooking Fuels and Associated Social Issues in Rural Punjab

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Abstract Biomass fuel, an economical organic renewable source of energy, is still intensively used for burning purposes in the majority of areas of rural Punjab. It mainly includes agricultural crop residues and animal dung which is easily available and found in abundance. But it's the dilemma of present times, that while on one side biomass fuel is facilitating the lives of residents of rural areas by providing them with a low-cost solution to meet their energy requirements, at the same time it is posing a potential risk to the health of rural women. These women are directly exposed to the health hazards of gases being released from the burning of biomass fuel due to longer contact hours. This research was conducted with the purpose to investigate how domestic cooking fuel is affecting the health and lives of women directly or indirectly. This research work was conducted in the year 2019, in three districts of Punjab, Okara, Hafizabad and Multan, with 480 data samples collected evenly in the research area. There were two slots, based on different age groups, defined for data collection. In response to investigating different social parameters and their association with health impact, it was found that rural women between the age group of 20 to 40 (slot 1) were suffering from mental health issues at a higher rate of 64 % while those with age group above 40 (Slot 2) were found at higher risk to physical health issues with 83 % of the studied population. Similarly, rural women belonging to slot 1, exhibited 87% of the workload and domestic fuel management responsibilities. The findings of this research exhibited significant variations of health impact on women for different sources of biomass fuel.

Keywords: air pollution, agricultural crop residue, animal dung, cooking

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1. Introduction

Biomass from crop residue and animal dung has been the oldest and most reliable source of energy for household fuel utilization for a long. New technological advancements have changed the means and living standards tremendously during the last few decades. However, the impacts of

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this mega shift have not yet trickled down to the common man of rural areas of developing countries. It requires immense efforts by the government and local organizations to transfer efficient and economical technology to the grass root level in developing countries of the third world. Consequently, the residents of rural areas in such regions are still bound to rely upon conventional sources of energy to meet their daily needs. Still, animal dung, crop residues, and forest clippings are the main source of fuel being used in such peripheries for cooking purposes and other such needs. Such sources, although available with ease and in excess, have a drastic effect on the lives of people, particularly rural women, due to continuous exposure to the hazardous impact of burning such sources of fuel.

The emission of hazardous gases from these sources leads to poor health conditions for the residents who are exposed to these sources of air pollution. Rural women are the ones who are most affected by such adverse environmental and health conditions due to maximum exposure to air pollution caused by burning biomass from different sources. Furthermore, there are social aspects associated with such critical environmental and health conditions which impart adverse effects on the health of rural women. Rural women are directly engaged in the collection and management of the biomass used as a source of fuel, particularly for burning purposes for cooking. Approximately 3 billion people, worldwide, rely primarily on biomass for cooking. Rural areas of developing countries are particularly reliant on biomass for cooking and heating. Women and children in these areas are often exposed to high levels of pollutants from biomass combustion that are associated with a range of respiratory symptoms. Rumchey *et al.*, (2007) found the level of indoor air pollutants was associated with the area of kitchen windows and the length of cooking time combined with the level of fire combustion. Sukhsolahe *et al.* (2013) assessed the respiratory and other morbidities associated with the use of various types of cooking fuels in rural areas of India and studied the relationship between the duration of exposure (exposure index [EI]) and various morbidities. Akhter (2007) conducted a study in rural Peshawar (Pakistan) and found a strong association between biomass fuel use and adverse health outcomes among test groups of females. In this regard, Balmes (2019) worked out that the lack of an appropriate ventilation system with inefficient cooking and heating modes using solid fuels resulted in exposure to improper air pollution and multiple diseases among females. The combustion of organically derived solid fuel is qualitatively similar to the burning of tobacco in terms of emissions of particulate matter and gases, and the mechanisms by which solid fuel smoke causes adverse health effects in human subjects are likely similar. The greatest estimated burden in adults is cardiovascular disease, but chronic obstructive pulmonary disease and lung cancer are important causes of disability and premature death in women, who are the primary cooks and tend not to smoke tobacco in developing countries. According to Imran and Ozcatalbas (2020), the use of biomass with traditional cooking technologies causes indoor air pollution and is responsible for 3.5 million deaths globally. The education of females in the household plays an essential role in energy choices. As cooking is mainly associated with females, educated ones choose clean energy sources in Pakistan. But the decision power is in man's hands in the community (Adusah-Poku *et al.*, 2022). Women play the main role in biomass-based energy systems in developing countries. The use of traditional biomass with traditional devices was found to be having negative impacts on rural women's life. Household composition, education, income, access to electricity and LPG, and distance from the market were found to be significant factors affecting the choice of fuels for cooking. Pakistan, being a developing country, is also facing serious energy crisis issues. Various studies examined that using modern energy could shift back to traditional fuels based on preferences, finance and needs (Schunder and Bagchi-Sen, 2019). Rural areas are still dependent upon biomass to fulfilling their fuel requirements. Women are mainly responsible for managing biomass throughout the year. It not only leaves a negative impact on their health conditions, but it relates to social issues as well. This research work investigates the role of rural women in dealing with biomass fuel management and determining the impact on physical

and mental health. It was also worked out to categorize the intensity of the impact of air pollution on health with changing scenarios related to social issues. The objectives of this study were to investigate the major health issues among rural women related to air pollution due to using domestic cooking fuels and determine a correlation between such health issues with the social problems being faced by these rural women.

2. Materials & Methods

2.1. Study area

A cross-sectional study was carried out in Punjab province to evaluate the health impact of air pollution due to biomass burning and its associated social issues among rural women of Punjab, which is the most populous province of Pakistan. There are thirty-six (36) districts in Punjab province and three (03) districts, Okara, Hafizabad and Multan were selected to conduct research work with a multistage selection technique. According to the 1998 census, 57.8 % of the total population of district Multan resides in rural areas, while that of district Okara's rural population is 77.16 %. Similarly, the rural population of district Hafizabad is 73 %. This study was conducted in the year 2019 as part of my Ph.D. research work. For data collection, a questionnaire was developed about all the queries regarding the assessment of the role of rural women in biomass management and its association with other social and health issues. Different variants were explored to obtain the correlation between significant parameters related to social and health determinants for rural women in the study area of Punjab province. Respondents were classified into two slots, showing the distinction between two age groups, and associated social sectors. Pie graphs were used to demonstrate the correlation between rural women of different age groups and their corresponding responses to different social parameters like behavior towards other women, level of knowledge and education, socioeconomic factors, health care facilities and adaptability towards new technical solutions to address energy and fuel issues. It also demonstrated social constraints towards addressing health issues of different age groups.

2.2. Data collection

Given obtaining representative information about mindset and approaches to deal with issues related to health problems due to air pollution originating from hazardous sources of fuel used for cooking and social aspects linked with related health issues in rural women, a questionnaire was prepared after reviewing all the requirements. All socio-medical issues were incorporated into the questionnaire developed. The questionnaire was designed in such a manner that it covers all the relevant data collection about the nature of medical and social issues faced by the rural women in the sampling area. The questionnaire was also focusing the trends and potential towards adaptability of newly available alternatives to cumbersome and toxic domestic fossil fuels. Randomly selected villages in the three (03) selected districts were visited and dispersed respondents were interviewed to fill out the questionnaire. Over all 480 respondents were questioned to obtain firsthand knowledge about the real situation in the study area. Biomass fuels which were mainly covered in this research work constitute mainly animal dung and agricultural crop residue, particularly cotton stalks. Major rural women's health parameters which are considered to be associated with domestic biofuels, their handling, management and utilization are fatigue, anxiety, higher stress level, blood pressure issues, asthma and impaired heartbeat. These health-related parameters are covered under two distinguished

categories of physical health conditions and mental health conditions of the respondents belonging to both Slots 1 and 2 of different age groups.

3. Results and Discussion

Based on the methodology adopted, the questionnaire was developed focusing on the target questions to obtain the required information from the respondents, which belonged to the three districts of Punjab province, constituting the study area. Data collected from the questionnaire is analyzed using pie charts and has been described as follows to correlate different determinants with the health conditions of rural women. The data was segregated and characterized based on two (2) slots, which represented two significant age groups of rural women.

3.1. Determining Proportion of Women Engaged in Cooking Activity:

It was required to find out how many rural women of a certain age group are engaged in the cooking activity for a specific time duration. In this regard, four (04) time durations slots were investigated. The findings are described in Fig. 4.1, which shows a specific proportion of rural women who are spending different time durations in cooking activities for both the slots of the rural women age group under investigation. For slot 1, indicating the age group between 20 to 40 years, it can be observed that maximum time duration i.e. 6 to 8 hours on daily basis is spent cooking by 80% of rural women. It depicted the level of responsibility and burden on younger married women. While for Slot 2, with an age group of more than 40, the proportion of women engaged in cooking activities is much reduced, as only 25% of women are occupied with this activity for a maximum duration of 6 to 8 hours on daily basis. This trend is quite justified and understandable as responsibilities are laid on the young ones and newly married women to look after all such household activities.

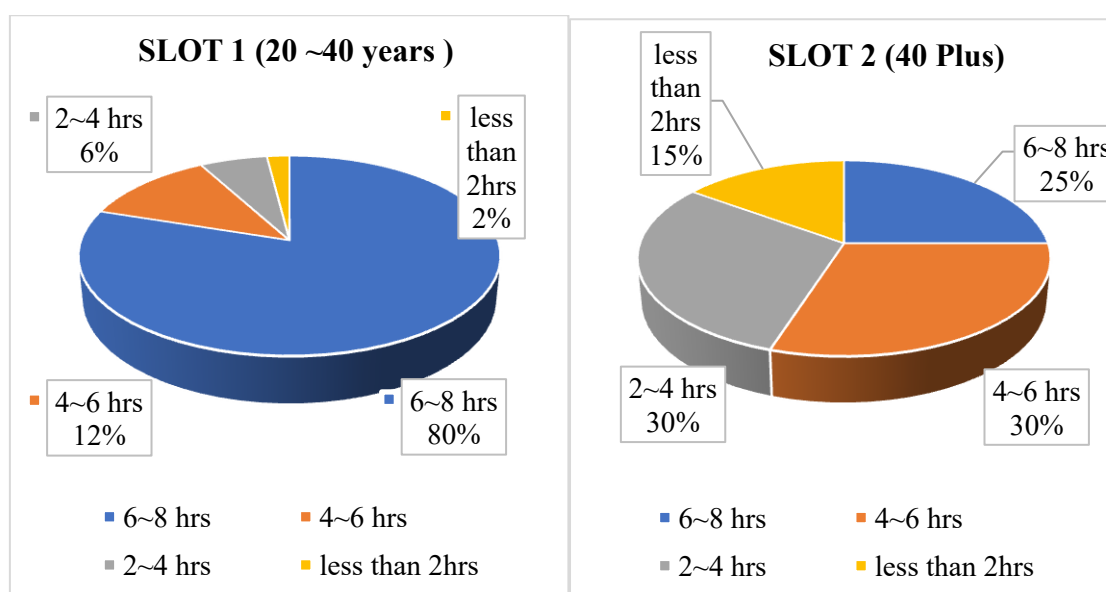


Fig. 1: Proportion of women engaged in cooking activity.
 (source: authors' calculation)

3.2. Determining the proportion of women facing health issues related to Asthma:

As there are not any intense sources of air pollution in rural areas other than indoor air pollution from cooking activity, therefore the exposure and contact time of rural women to hazardous gas emissions from domestic fuel (biomass) has become significant. Findings, as shown in Fig. 2 clearly, indicate that Slot 2 (40 plus rural women) is more affected due to Asthma i.e. about 60 % of women with an age group more than 40. Still considerable proportion i.e. 35 % of the relatively younger women group (age between 20 to 40) are facing a moderate level of asthma, which is an indication of an alarming situation regarding health issues of young women as well. It was investigated that ubiquitous environmental exposures, such as air pollution, increase the risk of asthma exacerbation in the general population through oxidative stress and inflammatory responses (Guarnieri, and Balmes, 2014) (Orellano et al., 2017).

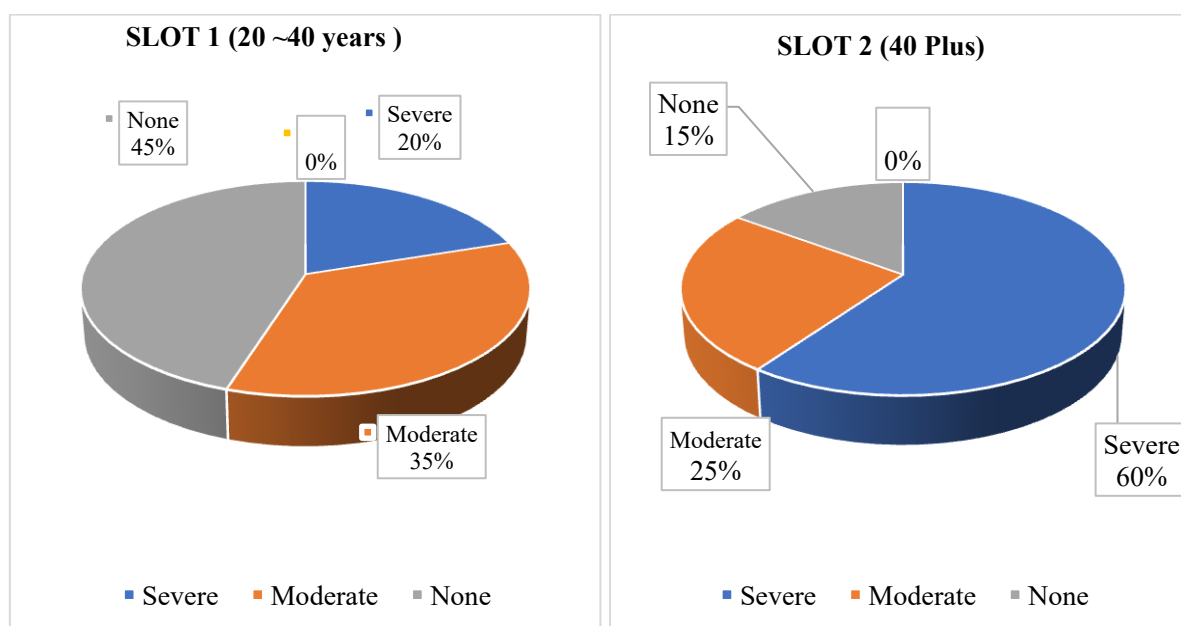


Fig. 2: Proportion of women facing health issues related to Asthma

3.3. Determining the proportion of Women facing Cardiovascular issues (Fatigue, BP, Heartbeat, pain in chest, heart attack history):

Cardiovascular issues in rural women are directly related to the level of stress and being overburdened due to excessive workload due to intense household activities. Such issues have a strong relationship with the age factor as with growing age rural women are more prone to cardiovascular issues. In one way or another other such issues are also linked with the social responsibility of the community toward younger women. Lack of cooperation is one of the factors which lead to such poor health conditions, including fatigue, blood pressure, heartbeat impairment, and heart attacks. Fig. 3 has demonstrated a varied distribution of trends of such cardiovascular issues in women of every age group. However, 55% of women with ages more than 40 are suffering from cardiovascular issues. It directly indicates the involvement of social issues associated with poor health conditions. Even the severe to moderate proportions of younger women age group are not ignorable because social issues are also definitely imparting their impact on worsening health conditions. Researchers found similar

findings through cross-sectional studies in different parts of developing countries. They investigated Significant relationship between biomass fuel use high blood pressure, pain in the chest and various heart diseases (Baumgartner *et al.*, 2011; Painschab *et al.*, 2013).

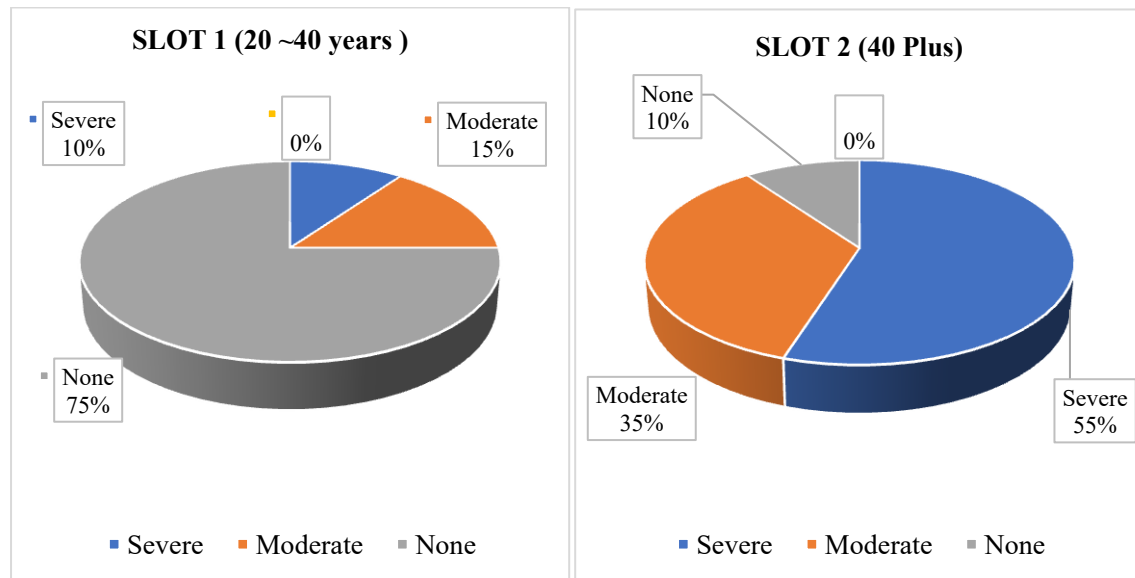


Fig. 3: Proportion of women facing cardiovascular issues.

3.4. Determining the proportion of women facing mental health issues:

The majority of mental health issues are left unaddressed and are not considered worth paying attention to in rural areas in most cases. It is associated with social issues like ignorance, the casual response from the male gender, not prioritizing such issues and connecting them with spiritualism, etc. The findings of the survey have presented a very alarming situation in this regard in Fig. 4. It can be observed that all the age groups are equally exposed to the threat of mental sickness irrespective of their age groups. Social issues are strongly associated with such adverse health conditions in young women as well as older women. Balmes (2015) studied that frequent use of biomass fuel created many mental health issues for women. It was investigated that use of biomass fuel was responsible for psychological issues, mental stress, mental illness, high blood pressure and depression. According to him all these issues always remained unreported. Another finding reported by (Shanker et al., 2020), identified that women's complete dependency on traditional fuels had arduous trials on their physical and mental health.

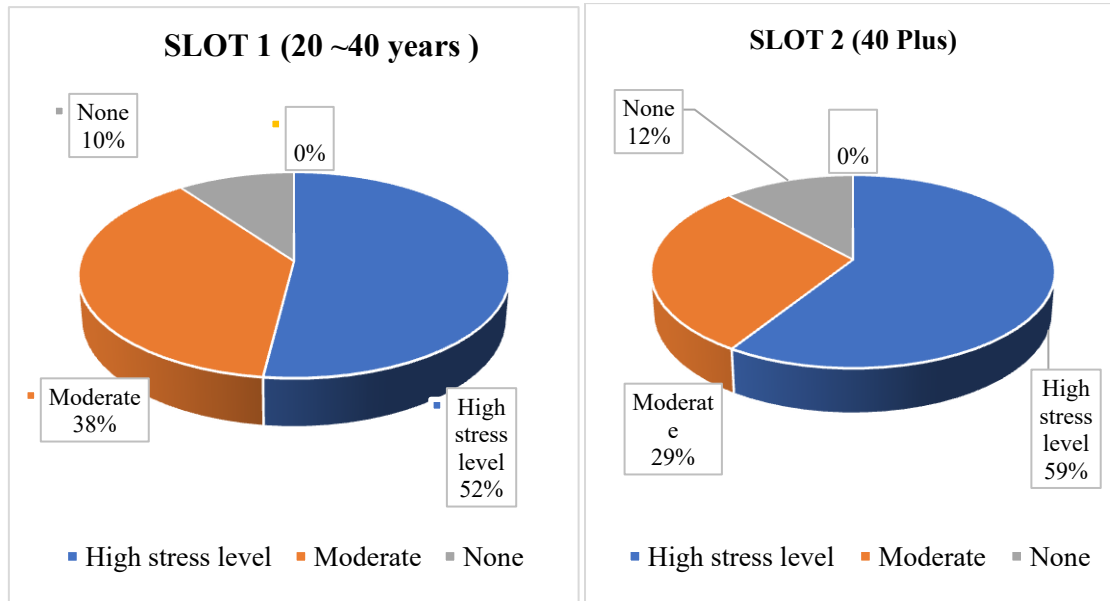


Fig. 4: Proportion of women facing mental health issues

3.5. Determining the proportion of women responsible for the management of Domestic fuel for cooking:

In rural areas of Punjab is the main responsibility of women to collect fuel for cooking and burning purposes. The only relief for elderly women is to get assistance from their kids in collecting and managing biomass from different sources. Fig. 5 has clearly shown a similar trend with dominating proportion of 87 % for younger women (Slot 1) who are mostly making the arrangements for biomass on their own. While for elderly women (Slot 2) the proportion is 62 %, relatively lower than the previous, due to the availability of assistance in the form of younger women as well as kids. Similar findings were investigated by (Hou *et al.*, 2022). They found family practices responsible for the management of domestic fuel for cooking. They also investigated the ages of females divides the duties and elderly women were more responsible for collecting fuel.

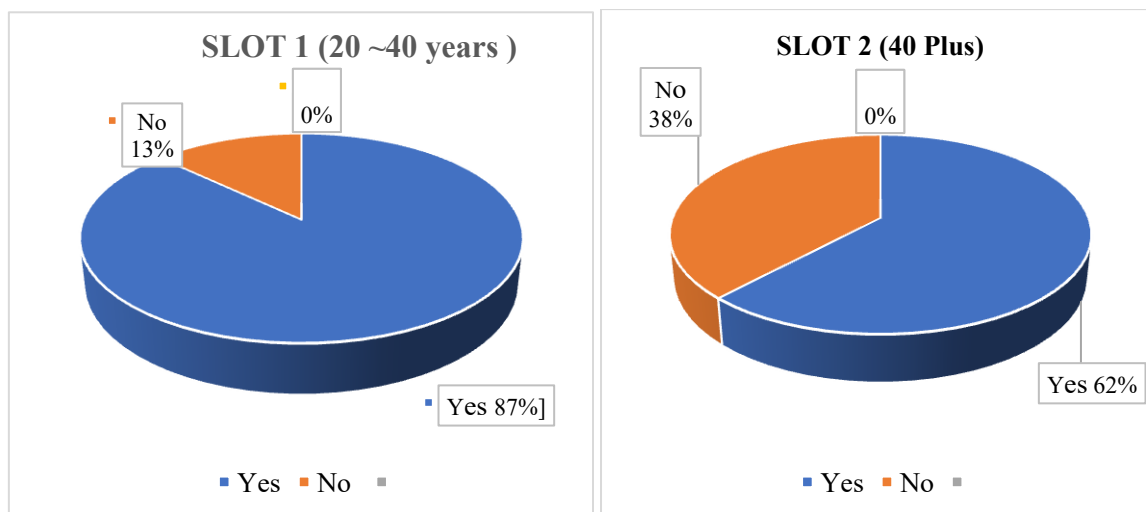


Fig. 5: Women responsible for the management of Domestic fuel.

3.6. Determining the proportion of women having awareness about physical health issues & their severity:

The findings of Fig. 6 exhibit that women of all age groups are well aware of issues related to physical health conditions. Elderly women a proportion of 83% have knowledge and understanding about the physical health problems faced by women while younger women are following this trend with a proportion of 72 %. The impact of media and information sharing through social sites is quite obvious and it has a positive role in educating rural women about health issues. Similar findings were given by Qasim *et al.*, 2013 in Sabour village. They evaluated that women were responsible for all types of kitchen activities but not aware of the adverse effect of fuel use. The majority of women residents there rely on biomass fuel use because of poverty reasons and lack of awareness. Another study by Naeher *et al.*, (2007) showed that due to a lack of education women do not know the hazards of biomass smoke. World Health Organization (2005) reported that uneducated rural women spent their lives under these threats. They are unaware, just like millions of smokers are unaware of the dangers of tobacco.

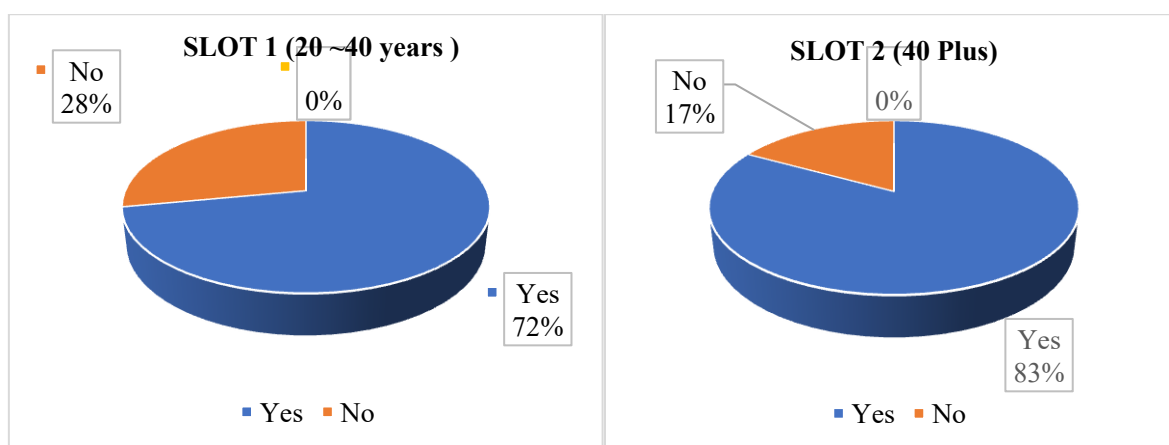


Fig. 6: Women having awareness about physical health and its severity.

3.7. Determining the proportion of women having awareness about mental health issues & their severity:

It can be observed from the findings as demonstrated in Fig. 7 that about 64% of younger women and 55% of older women are aware of mental sickness. It is only due to a lack of seriousness about the mental health of rural women. This issue has never been given importance rather it has been exploited socially to great extent. Asibley *et al.*, (2021) investigated that lack of awareness and lack of choices provided to women also appear as part of cultural limitations. And these limitations further lead to their mental health. Yadav *et al.*, (2019) examined that majority of rural women were following old methods of fuel during house chores because of a lack of awareness and they were facing severity in mental stress and depression.

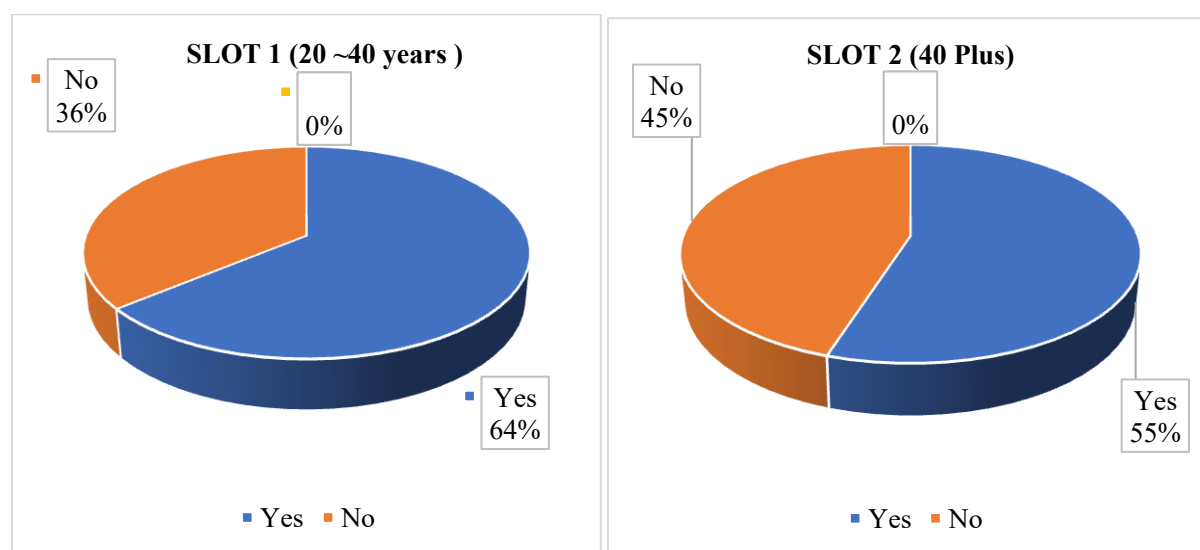


Fig. 7: Women having awareness about mental health and its severity.

3.8. Determining the proportion of women with easy access to medical facilities/aid:

There are two aspects covered regarding access to the medical facility. Firstly, it is about the provision of health facilities at the doorstep i.e. existence of satisfactory medical units within the villages or peripheries. Secondly, the ease by which patients can be carried to a better and well-equipped medical facility center, particularly in case of emergency regarding heart attacks, pregnancy, or trauma. The findings as described in Fig. 8 indicates that 45% of young women do not have access to any medical facility at the time of emergency. The response to elder women is much more satisfactory and 85% of rural women have confirmed access to medical facilities. This better response for elderly women is justified by the natural attention and affiliation of men towards his / her mother or elderly women being more respectable and honored by every person, whether it's a doctor or any other service provider.

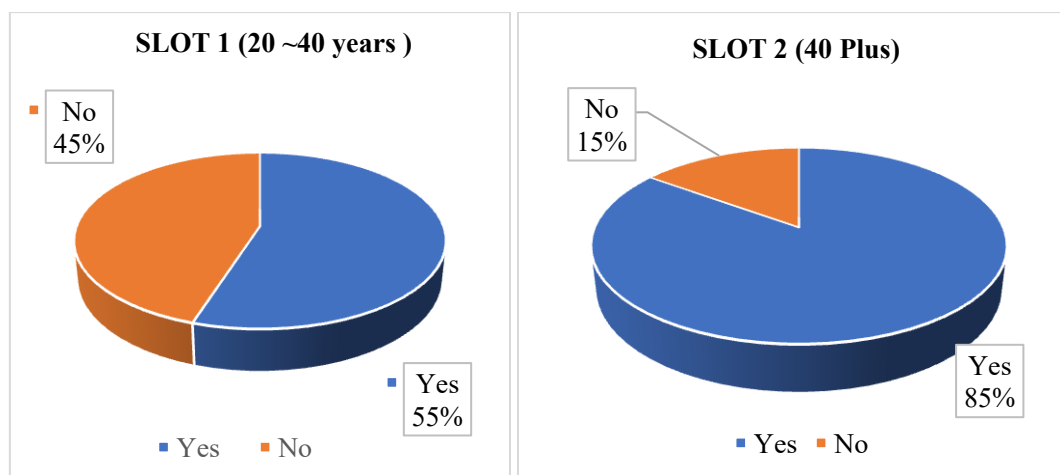


Fig. 8: Accessibility of women to medical facilities or aid.

3.9. Determining the proportion of women having assistance from other family members or males:

There are so many social factors involved in responding to providing help to rural women of different age groups. Fig. 9 indicates that only 22% of younger women of age group 20 to 40 are getting help from other family members or males while older women with ages more than 40 responded 58% with the availability of help and assistance from other family members. Again the local cultural values, lack of education and dominant personality syndrome are the main reasons for not helping the younger women with daily routine tasks. However, in the case of elderly women, the response is just opposite to the previous, based on factors including, respect for elderly women, particularly mothers.

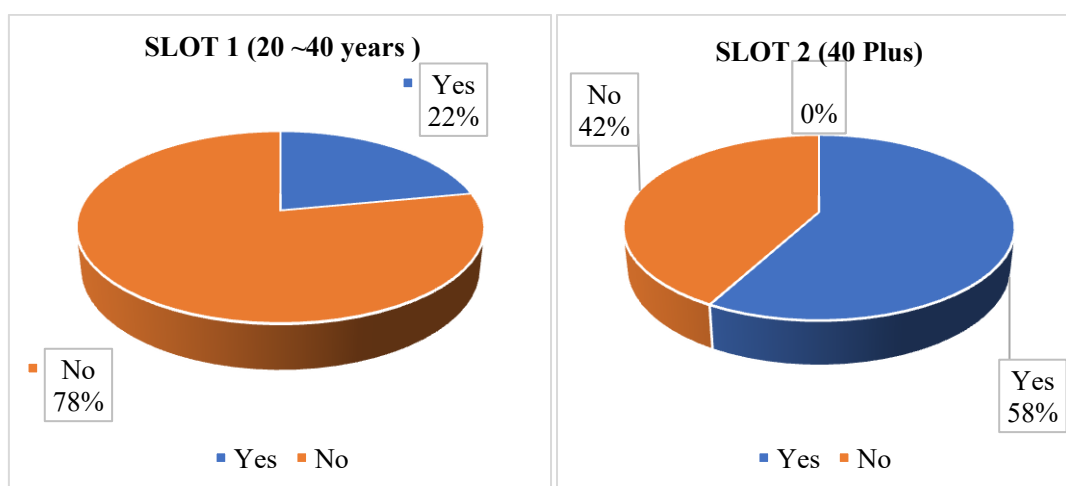


Fig. 9: Women having assistance from other family members or males.

3.10. Determining the proportion of women having adaptable approaches towards new means of cooking and new energy resources:

Under the influence of media campaigns, younger women in particular are more aware of new technologies related to cooking, which include the latest electrical appliances and others. Younger women being more at ease with new modes of communication, Facebook and the internet, are more well-informed about these technological developments. Therefore Fig. 10 depicts that younger women are more in favor of adopting the latest technologies even in rural areas. While elderly women with 48% proportion, are also mostly in favor of adopting easier modes of living and improving their quality of life. Imran *et al.*, (2019) investigated that people find it hard to follow the new energy sources in different rural areas because they find them complex. This is why Ntiyakunze-Stanslaus (2021) suggested with new forms of energy being provided, the need for educational awareness becomes necessary.

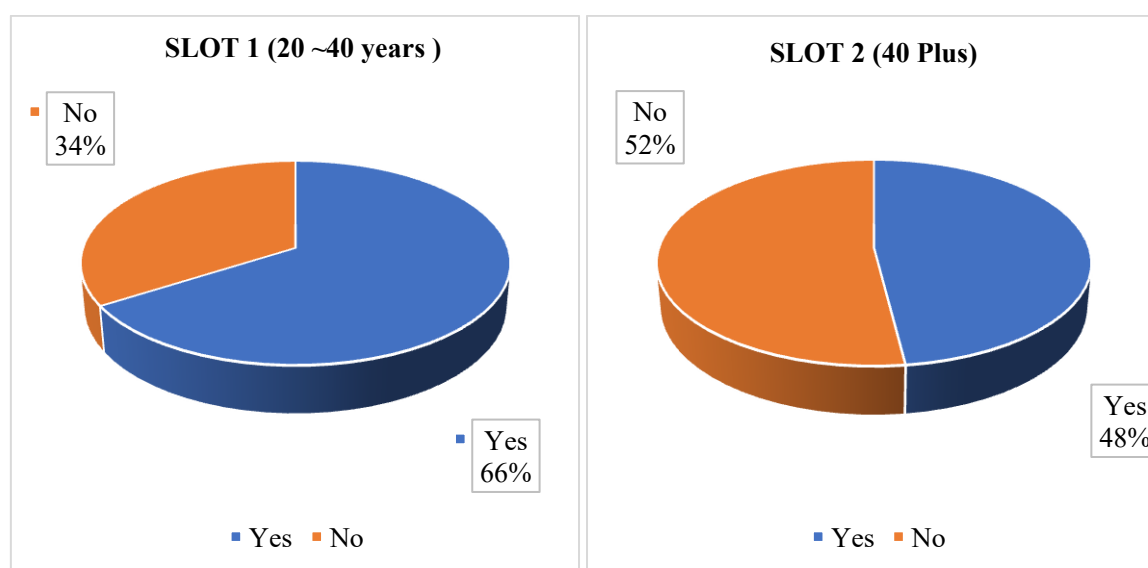


Fig. 10: Adoptability of women towards new technology

Based on the findings and their explanation, a strong correlation between physical health issues originating from domestic fuel for cooking and most of the social issues being faced by rural women has been established.

4. Conclusion

There are severe issues related to awareness of the intensity of health issues of adult women. Despite having awareness of the new means of cooking with cleaner fuels, adult women are deprived of providing such facilities due to economic reasons or conservative approaches still in practice. Adult women are facing severe problems related to mental stress and physical health due to the overburden of other responsibilities. Adult women in the age group 20 to 40 are at a higher level of risk for mental health problems, with 64% exposure, due to improper means of cooking and extra workload and responsibilities. However other influencing social factors, which could be affecting the mental health of rural women of this age group were not explored in this research. While on the other side, rural women belonging to the age group 40 and above (Slot 2) were having a higher rate of risk of physical health problems, particularly related to asthma and other associated illness with 83% exposure rate. Malnutrition can one of the reasons for poor health conditions of adult women, particularly during

pregnancy duration. Challenges being faced by rural women in approaching proper healthcare units or facilities is one of the major socio-medical problems.

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