Electrical Appliance Usage and Electricity Consumption Pattern at household level

V Vijaya Lakshmi[1] and M Milcah Paul[2]

Post-Graduation and Research Centre,
Professor Jayashankar State Agricultural University, Rajendranagar, Hyderabad (Telangana)

ABSTRACT

Electricity is one of the important secondary fuels used by all the consumers in the world. This study was undertaken to study the electrical appliance usage and electricity consumption patterns in residences. An exploratory research method was used on 30 randomly selected households in the sub urban areas of Hyderabad, Telangana State. A structured interview schedule was used to collect the data. The data collected were analysed using frequency, percentage and correlation. The results showed that the respondent households used a greater number of miscellaneous appliances as compared to the other appliances used for different purposes like cooking, heating, cooling, laundry etc. Majority of the households stood in the low consumption level (0 - 250 units/month) of electricity, classified as per the study. Majority spent Rs. 1 – Rs. 1000/- month as an expenditure for the electricity consumed, which was considered as a low level of expenditure.

Key Words: Consumers, Consumption, Electricity, Electrical Appliances, Residences.

INTRODUCTION

Electricity is one of the important resources required by everyone in this modern era. Due to the latest technological advancements; consumers are trying to be tech-savvy and lead an easy and comfortable life using the technology. As a part of this, they are trying to use different kinds of electrical appliances which help them to do their work comfortably and easily and save the time finally. Manufacturers are also trying to provide the consumers with various options. As a result, the electricity consumption is increasing day-by-day and in the race of staying comfortable, consumers are indirectly causing a lot of harm to the environment.

A combination of rapid electrification, increasing incomes, and technological development will result in people buying more appliances and using more electricity to run them (Khosla and Chunekar, 2017). They have expressed that already the residential sector uses about 25 per cent of the country's total current electricity consumption (with a 9% growth in 2015-16). Residential electricity consumption (REC) has increased by 50 times since 1971 and now constitutes about a quarter of India's total electricity consumption. All these are causing an extra burden to the nation to generate more electricity. Hence, a better understanding of REC patterns and the factors affecting it is essential for designing effective and credible energy efficiency programmes, optimise planning of capacity addition, and better adaption to the rapidly changing business models and technologies in the Power sector (Chunekar *et al*, 2016).

Hence, proper research has to be conducted about the appliance usage and electricity consumption patterns to get a clear understanding about the overall electricity consumption in residences and frame suitable policies accordingly to make India a better country in terms of promotion of 'Green' character. As consumers are also not very responsible while using the electrical appliances and this is causing a

Corresponding Author's Email: milcahpaul@gmail.com

[1]Principal Scientist, AICRP – H.Sc., PG&RC, PJTSAU, Hyderabad. Email: vijjikeetu@gmail.com

[2]Research Scholar, Dept. of RMCS, College of Home Science, Saifabad, Hyderabad

lot of harm to the environment. Hence consumers must be educated to use the electricity cautiously, select the energy efficient appliances and promote Green India. This study was undertaken to study the type of appliances used by consumers and also the electricity consumption and expenditure patterns in the residences in the sub-urban households.

MATERIALS AND METHODS

A large number of appliances are being used by consumers for different purposes in the present days. The appliances used by the study households were divided according to their purpose of usage for different activities like heating / cooling purposes, cooking purposes, lighting purposes, cleaning purposes, laundering purposes, recreation purposes and miscellaneous purposes.

An exploratory research method was adopted and the study was conducted in 30 randomly selected households in the sub urban areas like Lingampally, Hayathnagar, Patancheruvu of Hyderabad, Telangana State. A structured interview schedule was used to collect the data. The data collected were analysed using frequency and percentage. Correlation was used to analyse the relation between the selected dependent variable (energy consumption in units) and independent variable (number of family members in the respondent households' household).

In this study, electricity consumption is defined as the number of units used by the households per month. It was calculated by converting wattage of each appliance into kilowatts multiplied by the number of hours used in a day with 30 as number of days. Thus, after calculating for each of the appliance used by the households, everything was totaled up to get the total electricity consumption per month.

RESULTS AND DISCUSSION

Appliances used for heating and cooling purposes

The results (Table 1) regarding the appliances used for heating/ cooling purposes showed that around 93.33 per cent, 46.00 per cent and 6.66 per cent of the respondent used a ceiling fan, cooler and table fan respectively, for cooling purposes. As ceiling fan is one of the cheapest appliances which can be used for cooling and air circulation purposes in a living space, majority (93.33%) of the respondent households are using this appliance, when compared to the air coolers and air conditioners. It can be seen that none of the households used air conditioners, even though this has become a common appliance used by the consumers (air conditioners are costlier to buy and operate, release large number of chlorofluorocarbons into the environment and also use lot of electricity when compared to normal fans and coolers). The respondent households were using appliances which are eco-friendly, inexpensive and also energy conserving.

Around 60.0 per cent of the sample used refrigerator for cooling and preservation of foods. As the technology has developed, the prices of refrigerators have come down and large number of options is available in the market now-a-days. The earlier methods used for cooling and storage of preserved foods like *Janatha fridge*, mud pots etc. were not being used by the consumers in the present days. Hence, it can be seen that majority of the respondents used refrigerator, a modern appliance for cooling and preservation of foods. Geyser was used by around 6.66 per cent of the households for heating purposes. Earlier, there were boilers which were used for heating water in bathrooms. As times progressed, people are trying to use modern appliances like geysers to boil water. Exhaust fan was used by 6.66 percent for cooling and air circulation purposes.

Appliances used for cooking purposes

Grinder, juicer, toaster and food processor was used by 76.66 per cent, 6.66 per cent, 6.66 per cent and 3.33 percent of the households, respectively, for preparation of food and things related to it. About 10.0 per cent each used electric rice cooker and microwave oven to cook food. Grinder is one such appliance which was available in different varieties,

Table 1. Distribution of households based on the use of appliances for different purposes (n=30).

Purpose/ Appliance and Wattage required (Minimum and Maximum)	Frequency	Percentage	Purpose/ Appliance and Wattage required (Minimum and Maximum)	Frequency	Percentage
HEATING/ COOLING			LAUNDRY		
Ceiling Fan(25 – 75 W)	28	93.33	Iron Box(750 – 2000 W)	15	50.00
Refrigerator (150 – 400 W)	18	60.00	Washing Machine(700 – 2100 W)	13	43.33
Cooler(70 – 100 W)	14	46.66	RECREATION		
Table Fan(10 – 25 W)	2	6.66	Television(20 – 115 W)	26	86.66
Geyser(1000 – 2000 W)	2	6.66	Laptop(65 – 90 W)	4	13.33
Exhaust Fan(10 – 20 W)	2	6.66	Desktop(90 – 250 W)	4	13.33
COOKING			Radio(0.5 – 5W)	3	6.66
Grinder (500 – 1500 W)	23	76.66	DVD Player(25 – 60 W)	2	6.66
Electric Rice Cooker(200 – 500 W)	3	10.00	Music Player(50 – 200 W)	2	6.66
Microwave Oven(600 – 1700 W)	3	10.00	MISCELLANEOUS		
Juicer(400 – 800 W)	2	6.66	Charger(5 – 25 W)	24	80.00
Toaster(800 – 1800 W)	2	6.66	Mosquito Repellant(15 – 40 W)	14	46.66
Food Processor(300 – 400 W)	1	3.33	Water Pumping Motor(360 – 720 W)	6	20.00
LIGHTING			Water Purifier(20 – 60 W)	2	6.66
Fluorescent Lamp(40 – 150 W)	24	80.00	Modem (2 – 20 W)	2	6.66
Incandescent Lamp(60 – 200 W)	20	66.66	Shaving Machine (11 – 40 W)	2	6.66
Compact Fluorescent Lamp(20 – 55 W)	16	53.33	Stabilizer(50 – 150 W)	1	3.33
Night Lamp(10 – 40 W)	7	23.33	Water Dispenser (100 – 150 W)	1	3.33
Zero Bulb (5 – 15 W)	7	23.33	Calling Bell (1 – 2 W)	1	3.33
Emergency Lamp(15 – 30 W)	4	13.33	Sewing Machine Motor(40 – 80 W)	1	3.33
Bulb(30 – 100 W)	3	10.00	Hair Styler(750 – 2500 W)	1	3.33
Chandeliers(200 – 400 W)	1	3.33	Hair Straightener(75 – 300 W)	1	3.33
CLEANING			Door Bell(1 – 2W)	1	3.33
Vacuum Cleaner(900 – 1800 W)	2	6.66			

working mechanisms, designs and purposes; and which makes the food preparation works easy. Hence, majority of the consumers were now preferring grinders, though it works on electricity.

Use of lightening appliances

Majority (80.0%) of the households used fluorescent lamps; followed by incandescent lamp (66.66%), compact fluorescent lamp (53.33%), night lamp (23.33%), zero lamp (23.33%), emergency lamp (13.33%), bulb (10.00%) and chandeliers (3.33%) for lighting purposes. As the benefits of fluorescent lamps (like energy efficient, cost-effective, long life-time etc.,) are being wide spread now – a – days among the consumers, majority of the consumers were preferring fluorescent lamps when compared to the other lamps for lighting purposes.

Vacuum cleaning was not much preferable and practiced by Indian consumers, particularly at the house hold level. The results of this study also support this, as very few (6.66%) number of respondent used vacuum cleaners for cleaning purposes. Around half (50.0%) of the respondent used an iron box and 43.33 percent used washing machine for laundering purposes. The use of washing machines was also found to be increasing as consumers find it as an option which saves times and effort as compared to the manual washing.

Use of electrical gadgets

Majority (86.66%) of the households used a television followed by laptop and computer (13.33% each); and radio, DVD player and music player (6.66%) for their recreational purposes. Television was a favourite appliance for the consumers in order to have some recreation in the house itself. As the use of mobile phones, laptops, desktops and modems is increasing tremendously among consumers; the appliances like radio, DVD player and music player are not being used by most of the consumers (all the uses and mechanisms of radio, DVD players, music players etc. are inbuilt in one appliance like desktop/ mobile phone).

Use of miscellaneous appliances

About 80 per centof the households used other miscellaneous appliances like charger for mobiles; followed by mosquito repellant (46.66%); water pumping motor (20.0%) and water purifier, modem, shaving machine, stabilizer, water dispenser, calling bell, sewing machine motor, hair styler, hair straightener and door bell (3.33% each). The number of miscellaneous appliances used was more compared to the other appliances used for different purposes. This showed that the households involved in this study and also the consumers in general were using many new and innovative appliances even for small activities which can be done manually too.

Electricity Consumption per month

The results in the Table 2 showed that majority (43.33%) of the households consumed electricity between 0 – 250 units and 40 per cent consumed electricity between 251 units – 500 units and the remining 16.66 per cent consumed between 501 – 750 units. It was good to see that majority of the households involved in the study stand in the low consumption level (0 - 250 units/month) of electricity, as per the study. The respondent households who stand in the high level of electricity consumption (501 - 750 units/month) must be educated about the importance of energy conservation.

Expenditure on Electricity

In this study, expenditure on electricity consumption is defined as the money spent by the respondent households on electricity per month. The results (Table 2) showed that majority (46.66%) of the households spent Rs. 1 – Rs. 1000/- month as an expenditure for the electricity consumed by them, which was considered as a low level of expenditure for electricity, according to this study. Around 33.33 per cent spent Rs. 1001/- to Rs. 2000/- and considered as a medium level of expenditure for electricity. The remaining 20.0 per cent spent Rs. 2001/- to 3000/-, which was considered as a high level of expenditure for electricity. Such category of people must be educated about some tips to

Table 2. Distribution of Respondent households based on the electricity consumption levels expenditure spent. (n=30)

Sr. No.	Parameter	No. of Units	Frequency	Percentage
A.	Consumption Level			
1.	Low	0 - 250 Units	13	43.33
2.	Medium	251 - 500 units	12	40.00
3.	High	501 - 750 Units	5	16.66
B.	Expenditure Level	Amount Spent (Rs.)	Frequency	Percentage
4.	Low	1 - 1000	14	46.66
5.	Medium	1001 - 2000	10	33.33
6.	High	2001 - 3000	6	20.00

conserve electricity, so that they can save the energy and also their money.

Correlation between the number of family members and energy consumption

The correlation value between the dependent variable (energy consumption in units) and independent variable (number of family members in the respondent households' household) was found to be 0.279. This showed that there was a significant correlation between the number of family members and energy consumption levels; which means that more the number of family members, more will be the energy consumption.

CONCLUSION

The study resulted in both positive and negative aspects. The positive aspects included: a smaller number of heating/ cooling appliances were used by the respondent households, as these consume most of the electricity; majority of thehouseholds belonged to the low electricity consumption level and low expenditure level for electricity. The negative aspects included: a greater number of miscellaneous appliances were being used; one-fifth of households also belonged to the high electricity consumption level and high expenditure level for electricity. The number of miscellaneous appliances used was more as compared to the other appliances used for different purposes. This shows that the households involved in this study and also

the consumers in general, now-a-days, are using many new and innovative appliances even for small activities which can be done manually too. This is not a good practice, as it is not eco-friendly. Hence, proper education and awareness must be given to the consumers about the importance of less energy consumption and more energy conservation. Government can come up with some initiatives that give rewards or awards to households that consume electricity properly, on a regular basis; in order to motivate the consumers and households to use less amount of electricity. This will benefit the individuals, households, nation and the environment on the whole. All these acts would promote the concept of Green India.

REFERENCES

Chunekar A, Varshney S and Dixit, S (2019). Residential Electricity Consumption in India: What do we know?,Prayas (Energy Group).

Khosla R and Chunekar P (2017). Plugging in: Electricity Consumption in Indian Homes. Centre for Policy Research (CPR) and the Prayas (Energy group).