Original Article

Assessment Of Factors Contributing To The Medication Wastage In Families In Goa (India): A Qualitative Study

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Abstract

Medication wastage in household describes any medicine which are not consumed by the patient and remains unused leading to expiry and also includes medicines which loses its therapeutic value due to damage due to improper storage condition or improper handling. The aim of the present study was to find out the extent and reason behind the medication wastage in families in Goa (India). Study was carried out using door to door cross sectional survey adopting snowball sampling method. 250 households from five major cities of Goa were surveyed using questionnaire. It was observed that mean (SD) family size of Goan household was 3.76(1.23) members. It was revealed in the survey that 59% of the families procured medicines from the nearby pharmacy. Most common medicine stored in the household were analgesic/ antipyretic drugs (17%) mean (SD) 2.67 (1.76). 16% of the medicine stored in the household were expired, whereas 22% remained unused.18% of the people stopped the medication after resolving the symptoms and thus did not take the complete prescribed dosage, whereas 12% of the people stopped the medication after experiencing side effects. Families having children as well as elderly member tend to stock more medicine 24.69(2.01). It was found that level of education is directly proportional to the amount of storage of medicine. Head of the family who were graduate, post graduate tend to store more medicine having mean (SD) 13.21(1.12) and 15.11(1.36) respectively. Financially stable families tend to store more medicine 15.37 (0.96). Medicine wastage is serious issue in Goan families and can be reduced by proper patient counselling and awareness.

Keywords: Medication wastage, Goa, Cross-sectional survey, snowball sampling method, unused medication

INTRODUCTION

India is considered as the pharmacy of the world as country contributes more than 20% of the world pharmaceutical demand of generic medicine, and more than 60% of demand of vaccines. In 2021 Domestic pharmaceutical market size was estimated to about $21 billion with potential to expand to $ 120 billion by 2030 [1]. Pharmaceutical supply chain in India is highly organised and dynamic, making medicines freely available for the patients [2]. To achieve quick recovery from any disease or maintenance of disorder and to achieve overall patients' wellbeing, prompt supply and availability of medicines is the crucial parameter. Supply and demand of the medicine can be achieved by reducing the loss of the medicines, either in during transport or storage after sales. Medicines are the essential requisites of the supply chain. However low GDP and developing countries face a serious problem to make the essential medicines freely available to the patients. One of the measures of preventing shortage of medicines is to reduce medicine wastage at households [3].

World Health Organization (WHO) defines medicine wastage, as any medicine whose shelf life is over, or is unused for long time, or stored inappropriately, or is contaminated and thus have affected its quality and have to be discarded [4] WHO further states that utilisation of unused medication in any form should be minimised and it should be counted as a medical waste [5]. WHO report states that Patient compliance, and decline in medication adherence has been one of the major reason of medication wastage [6]. Medication wastage in household is major concern to the healthcare system as it directly implies the non-compliance of the patient towards the therapy. Unused medication lying on the shelf in the houses is also important concern as it can be misused and can lead to health hazard if they are accidently or intentionally consumed by the children [7]. Not using the medicines for longer time as well as improper storage not only reduces and hampers therapeutic effect of medicine but it can affect the financial aspects of the family [8]. Medication wastage may be the result of not using the medicines (Prescribed or Over the Counter) for longer time, or due to damage or loss of medicines due to negligence, spillage, contamination. Issue of medication wastage is not confined to any specific area or country but is global issue and

is increasing with time [9]. Studies have revealed that in United States medication wastage accounts for more than $2.3 trillion annual expenditure on health [10]. Excess stocking of the medicines was the key reason for wastage of medication in Tanzania [11, 12]. In Uganda similar studies were conducted which proved the main reason for medication wastage was lack of technical skills in handling and monitoring the expiry of the drugs [13, 14]. In Ethiopia more than 8% of the total medicine was expired due to poor supply chain management [15].

In Arab countries such as Oman, Saudi Arabia disposal of unused medication is a major concern due to lack of awareness as programs for recalling the unused medication [16]. Survey has revealed that more than 50% of unused medication in Saudi Arabia were analgesics, followed by antibiotics [17]. Most countries do not have any program governing and regulating medical waste. Malaysia had initiated Program under Ministry of Health as "Return Your Medicine Program" for reducing domestic medication wastage.16 Long back in 1988 United States had brought an act named as Medical Waste Tracking Act known as MWTA to streamline control and manage and maintain record of medical waste.

Reasons for medication wastage in households are diverse. It may be attributed to lack of knowledge regarding proper storage, improper patient counselling, lack of patient compliance, buying wrong medicine, or near to expiry products, buying excess medicine, discontinuation of the treatment due to side effects [18,19].

Goa is the smallest state in India, accounting for highest per capita income amongst the different states of the country [20]. Goan population is financially well off, having highest literacy rate and having free access to the healthcare needs. The primary aim of the present study was to determine the extent of medication wastage in Goa as compared with global scenario, as well as reason for the medication wastage and its financial implication on the financial budget of the family. Disposing the expired medicine is also a worldwide concern as if it is disposed in sink or in waste may lead to water pollution, soil pollution which affects the biodiversity [21, 22]. Unused Medication is also significant potential threat if it medicines are not kept out of reach of children. This study is the first of its kind research survey conducted in Goa (India) to determine the medication wastage in families. In this cross sectional survey, medication wastage was defined as any medicines which is expired, or damaged due to any reasons, or unused for long time, or missing the label.

EXPERIMENTAL TECHNIQUES

Design

This was a cross sectional, observational survey carried out as part of Objective structured clinical examination (OSCE), for submission to Goa University for Bachelor of Pharmacy education program. Survey is carried out as per the standard methods [23].

Setting

The study was conducted in five main cities of Goa, having Population of about 375000 viz. Panaji (15°29′56″N 73°49′40″E), Margao (15°16′25″N 73°57′29″E), Mapusa (15.60°N 73.82°E), Vasco (15°23′53″N 73°48′40″E) and Ponda (15.40°N 74.02°E) during the period from January 2022 to February 2022. In each city researcher visited 60 families using Snowball sampling method, where research participants introduced the researchers to next family participant. Paper based survey form was designed in the form of questionnaire (Annexure I), and pilot study with on 10 participants was carried out and necessary changes were made in the form. Result of the pilot study was not included in the study. Survey form was circulated to the professionals for their comments and approval.

Inclusion, Exclusion Criteria, Sampling and sample size

Inclusion criteria was developed before starting the survey, where in households having minimum 2 members in family and having at least one prescription medicine were allowed to participate in research survey. Exclusion criteria was single member family and families not having even one prescription at home. Students of third year Bachelor of Pharmacy, who were assigned project under OSCE, were made aware about the aim and objective of the survey, and about data collection technique. At the beginning of the survey, participants were made aware of the objective of the study and were informed that survey was purely voluntary and they can opt out at any stage of the study. Participants were informed that any personal information will be kept confidential and only numerical and aggregate data would be reported. Researchers personally visited the houses of the known person in the city with the prior appointment and examined the stocking place of the medicines and entered the observations in the survey form with the help and consent of participants. Once the survey was complete in one household, participant introduced researchers to the neighbors and family friends. Sample size was limited to 250 families from five cities of Goa.

In this survey medication wastage was defined as medicines available in house and which are not in use during the time of survey, or those medicines whose shelf life is over, or manufacturing/ expiry date is not clearly visible, or if medicine pack is damaged. One month after the opening of the eye drop container was considered as expired product. Cost of medicine was calculated as actual what is written on the label of the medicine as maximum retail price (MRP). Medicines whose MRP was not visible on the label were calculated as per the prevailing market price.

Questionnaire

Questionnaire of the survey was divided in to VII parts (Annexure I). Part I consisted of questions collecting information regarding family demographics. Information such as number of family members, age group they belong, educational background, family income, number of earning members, and expense on healthcare was recorded. Part II of the questionnaire accessed the mode of procurement of medicine such as whether purchased online, retail chemist or from physicians as physician sample. Part III of the questionnaire seeks the information regarding on whose advice medicine had been procured such as doctor's prescription, pharmacists advise, self-medication, friends/relatives advise or whether influenced from social media advertisement. Part IV of the questionnaire is to check the condition of the label of medicine, whether it's clearly visible of label is destroyed. Part V of the questionnaire is to check the unused medicine expired medicine, & medicine in use in terms of units and cost (in Rs.), Part VI Questions were design to find the reason for not using the medicines, such as Physician asked to stop it, Experienced side effects etc. Part VII whether to know types of medicines. Whether its Ayurvedic, Allopathic, or Homeopathic. Part VIII is to know the category of the drug whether its Analgesic, Anti-infective, Cardiovascular drugs, or drugs acting on respiratory system etc.

Ethical Approval Statement

Ethical Clearance certificate for the study was obtained from ethical committee of the PES's Rajaram and Tarabai Bandekar college of Pharmacy, Farmagudi, Ponda Goa. Participants gave written consent for this study and for publication.

Data Analysis

Response to each question was entered in the place designated in questionnaire by the student researchers and data was analyzed using the Statistical Package for Social Sciences (SPSS) version IBM SPSS Statistics 28.0.1.1 for Windows (SPSS, Chicago, IL, USA) Data was analyzed by parametric and non-parametric test. Data was analyzed by independent T test for quantitative variable such as family size, number of employed family members. Spearman's correlation was applied for ordinal variable to find relationship between amount of medicine or drug product stored. Variable such as number, type or category of medicines available at home, reasons for unused medicines, demographics were analyzed by summary statistics. P Value less than 0.05 was considered significant throughout the result analysis.

RESULTS AND DISCUSSION

Survey was done as per predefined selection criteria in five different cities of Goa, namely Panjim, Margao, Mapusa, Vasco and Ponda as these cities being the headquarters of talukas Tiswadi, Salcete, Bardez, Mormugao and Ponda respectively and hence represents socioeconomic characteristic, social and financial aspects of the whole Taluka and the state. From each city 50 families were selected as per the snow ball sampling method, where family who undertook the survey introduced the researcher to the next neighborhood family. All the selected families voluntarily agreed to participate in survey. Total sample size was about 250. Demographic, social and financial background of the family is depicted in Table -1.

Age	N=902	Qualification of the Head of the family	N=250	Family Income	N=250
Below 6 years	90	Illiterate	NIL	Below 10 thousand	5
6-20 Years	154	Primary Education	10	10 thousand to 50 thousand	79
20-60 Years	491	Diploma/ Graduation	176	50 thousand to 1 lakh	91
Above 60 Years	167	Post graduate and above	49	1 lakh and above	64

Table -1: Demographic, social and financial background of family

Socioeconomic background of the family

The mean (SD)of total members of the family was 3.76 (1.23). Children in the families below 6 years were 10% (90/902), children above 6 years and teenagers constitute of 17% (154/902), Members between age group 20-60 were about 54% (491/902) and elderly people above 60 years of age were 19% (167/902). Head of the family of all the family interviewed were educated and no one was illiterate. Members with primary education were 4% (10/250), Having received Diploma or Graduation from University were 70.4% (176/250), and people with higher qualification were 19.6% (49/250). Monthly family income depicts whether family belongs to lower income category, middle class or upper class. 2% (5/250) of the family had low income below 10thousand per month, 31.6% (79/250) families had monthly income up to 50thousand per

month, whereas 36.4% (91/250) and 25.6% (64/250) belonged to middle and upper middle class having monthly family income up to and above 1 lakh respectively.

Method of medicine procurement

The most common method of procurement of medicines was from retail chemist 58.8% (147/250), followed by online purchase 8.4% (21/250), few medicines were directly purchased from physician 4%(10/250) or obtained as physicians sample 6.8% (17/250). Majority of the medicines (43.6%) available at home were prescribed by physician, some medicines (32%) were obtained over the counter with pharmacists' advice. Few families had procured the medicines (6%) on friends / relatives' advice. 4.8% medicines lying at home were brought under the influence of social media advertisement. 60% unused medicines lying on the shelf at home were allopathic, 27% Ayurvedic, were 10% were Homeopathic, and 2% belong to Siddha, Unani or other class. Observations have been depicted in Table -2. And Fig I and Fig II.

Table -2: Pattern of Medicine purchase and procurement in Goan household

Mode of Procurement of medicine	N (250)	Medicine procured on advice of	N (3321)	Type of medicine	N (3321)
Online	21	Physician	1448	Ayurvedic	896
Retail chemist	147	Pharmacist	1063	Allopathic	1992
Purchased from Physician	10	Friends/relatives advise	195	Homeopathic	332
Physicians sample	17	Social media advertisement	159	Siddha/Unani	66

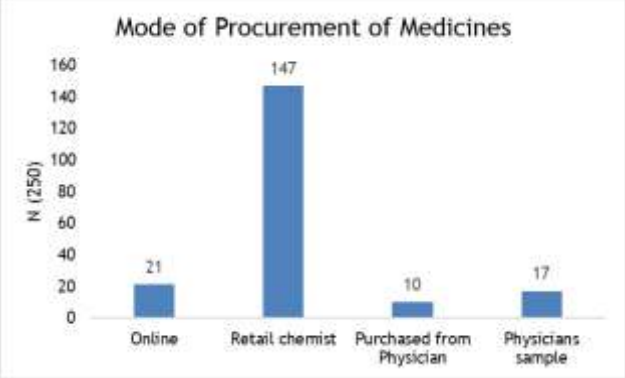

Fig I: Mode of Procurement of Medicines

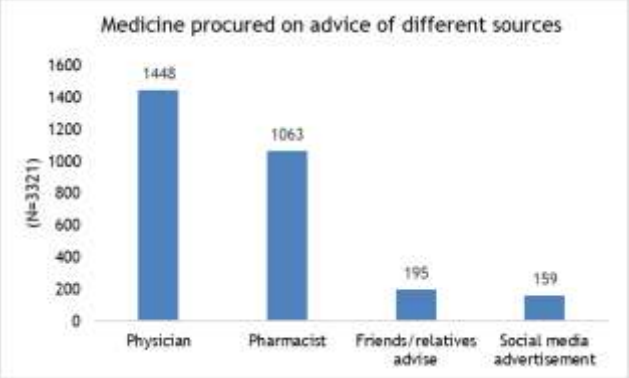

Fig II: Medicine procured on advice of different sources

Medicines found in house during survey were listed and counted as per their category and have been shown in Table-3. Analgesic, antipyretics were found present in more numbers constituting 17% of the total household medicines followed by antibiotics accounting to 13% in all the families. Amount of expiry found in ophthalmic preparation was alarming which was about 60% of all the expiry. Paracetamol tablets were most common drug available in all households.

Table -3: Categories of drug found in Goan houses

Category of drug found in houses	Units N=3321	Percentage	Mean ± SD	Number expired	Percentage
Respiratory drugs	113	3	0.51 ±0.61	13	12
CNS Drugs	130	4	0.47±0.57	10	8
Antibiotics	439	13	1.59±1.44	109	25
Gastrointestinal	301	9	1.36±1.37	56	19
Nutritional	209	6	1.10±1.13	20	10
Musculoskeletal/joints	151	5	0.67 ±1.19	32	21
Dermal preparation/ Anti allergic	104	3	0.46 ±0.66	26	25
Ear/Nose/ Throat	290	9	1.23± 1.29	14	5
Cardiovascular	371	11	1.79±1.36	0	0

Ophthalmic Preparation	107	3	0.48±0.51	64	60
Analgesic/Antipyretics	571	17	2.61 ±1.76	41	7
Antidiabetics	323	10	0.56 ±0.36	0	0
Miscellaneous	212	6	1.75 ±1.23	138	34

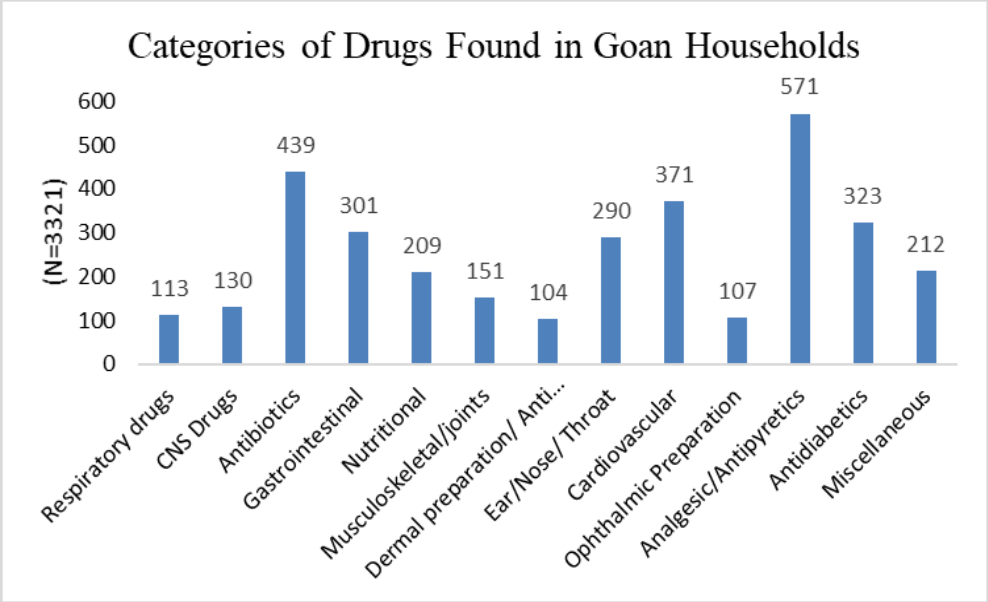

Fig III: Categories of drugs found in Goan Households

Storage of medicines

Storage place for the medicine in Goan houses was mostly in bedroom of the head of the family. 37% of the medicines were stored near the bed, 36% of the medicine were stored in separate cabinet dedicated for medicines, followed by 18% of the medicine was stored in bedroom cupboard as depicted in Table-4.

Table - 4. Place of storage of medicines (n=3321)

Variable	Frequency	Percentage
Storage place		
Separate cabinet dedicated for medicine storage	1211	36
Bedroom cupboard	584	18
Near bed	1219	37
Kitchen	155	5
Bathroom	132	4
No specific storage place	20	1

Table- 5 shows the actual status of medicines stored in houses. 63% of the medicines were in use. Where as22% of the total medicine was not in use for the reasons specified in Table. 6 and Fig I.

Table - 5: Status of medicine found in Goan Households (n=3321)

Status	Frequency	Percentage	Total cost (Rs.)
Medicine in Use	2082	63	303972
Expired Medicine	523	16	103071
Unused medicine	716	22	212505

Table-6: Reason for discontinuation of medicine.

Reason for not using medicine	Frequency	Percentage
Discontinuation of medicine by the Physician or change in medication	196	16
Stoppage of medication after cured from symptoms	217	18
Experienced side effects	149	12
Forgot to take the medicine	103	8
Medicine got damaged due to improper storage	51	4
Total	1239	58

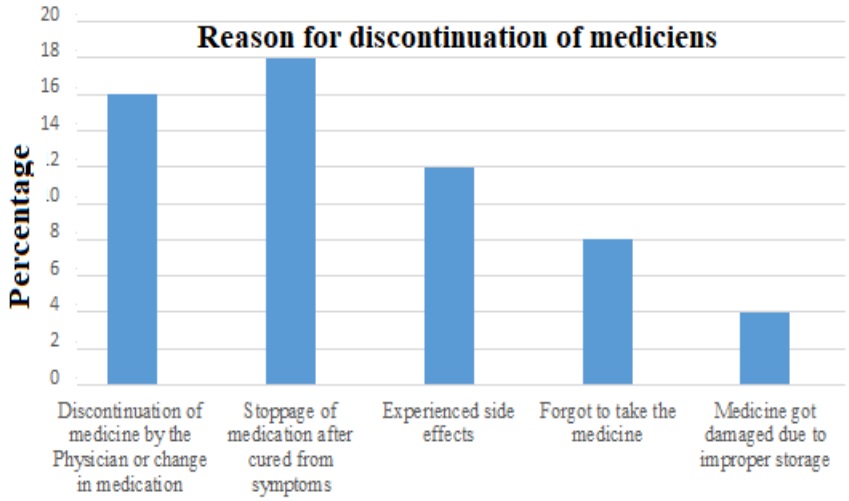

Fig IV: Reasons for discontinuation of medicines

It was observed that families having children below 6 years of age and their grandparents, tend to stock more medicines (24.69±2.01). out of Total 250 families surveyed 24 families had all group range members as shown in Table-7.

Table-7: Medicine stocking trends in different families

Families having	N 250	Medicines	
a. Children Below 6 years	60	10.24 ±1.96	***P* Value 0.002**
b. Members above 60 years	89	17.58± 1.54	
c.Both the a & b category	24	24.69±2.01	
d. Only 20-60 years	77	6.96±0.54	

Families whose head of the family was well educated (Diploma and above) tend to stock more medicine as shown in Table-8.

Table-8: Medicine stocking trends as per the education level of head of the family

Education level of Head of a Family	N	Medicines	
Primary	10	7.84±0.69	***P* Value 0.003**
Diploma or Graduate	176	13.21±1.12	
Post graduate and above	49	15.11±1.36	

Family income was the important criteria as income enhances buying capacity of the family. Family who had monthly income more then 50 thousand tend to stock more medicine as depicted in Table-9.

Table-9: Medicine stocking trends as per the financial status of family

Family income of the Family	N	Medicines	
Below 10 thousand	5	8.12±0.34	***P* Value 0.003**
10 thousand to 50 thousand	79	10.35±0.69	
50 thousand to 1 lakh	91	15.37±0.96	
1 lakh and above	49	13.21±0.36	

Perception of family members about medication wastage has been depicted in Table-10, which shows that more than 50 % of the family members are not aware about the seriousness about medication wastage and its economic implication thereafter.

Table- 10: Public Perception about medication wastage (n=376)

Statement	Agree % (n)	Disagree % (n)	Not sure % (n)
I am aware about unused medication	23.6(89)	50.7(191)	25.5(96)
I am aware that medication wastage is an economic burden	25.5(96)	42.8(161)	31.6(119)
I feel that medication wastage is not an issue	33.7(127)	26.8(101)	39.3(148)
Government should adopt buy back policy for unused medication	64.0(241)	25.7(97)	10.1(38)

DISCUSSION

Medicines play a pivotal role in treatment or management of disease or disorder and helps in in maintenance of healthy life style.24 People have tendency of stocking of medicine in anticipation of certain medical emergency. Multiple factors have been reported which leads to medicine wastage [25]. Previous studies have reported that people are unaware about the impact of medicine wastage on society [26, 27].

Our study discovered attributes and approaches of the Goan families towards the medicines. As per the Government of India Census Goa has one of the highest literacy rate accountings to 89% amongst all states of India [28], and same was reflected in our survey but there was no significant relation between literacy and expiry of medicine at home. Ours was the first cross sectional survey conducted to analyze the medication wastage and reasons underlying for the same, in Goan households. In this study student researcher personally visited the participants houses, examined the storage condition and status of medicine and entered the data personally by interviewing the participants thus completely reducing the errors which would have been otherwise possible due to lack of technical knowledge of participants. Verbal consent was taken from all the participants by making them aware about the objective of the study. Due to small sample size, results of this study are just indicative and thus cannot be generalized to each and every goan families. In this study different strength of the same medication were counted as one unit. Cost of the medicine was counted as per maximum retail price written on the label, if label was damaged or maximum retail price was not visible for some or other reason, its price was calculated as per the actual market price prevailing the survey.

In our study we tried to analyze amount of storage of medicine and medicine wastage thereafter, in houses with different variable such as number of children, number of old people in the family, education level of head of the family, family income and place of storage of medicine. Results revealed that more medicines are stored in houses having children and old people. Our observation is in coordination with the previously reported similar studies carried out in other countries [29, 30, 31]. Self-medication is one of the reasons for unnecessary storage of medicines leading to overstocking and eventually leading to medicinal wastage [32, 33]. Medication wastage is comparatively more in this families, mainly because of stoppage of medicine use after cure of symptoms in these categories of people. Another important parameter of medication wastage we found out in our study was directly proportional to the level of education, Head of the family or other family members if are highly educated, tend to store more over the counter medicine for self-administration, stocking the medicine more than required is the crucial reason for the medication wastage. This observation corresponds with previous studies carried out in different countries [34,35]. Middle class and upper middle-class families also stock the medicine more than required mainly because of causal approach of buying more medicines then actually needed as affordability is not the factor for such families. It was reported that availability of medicine in excess may lead to chronic medication followed by discontinuation which may be result of lack of patient compliance [36, 37].

In our survey we also observed that cardiovascular medicines, such as antihypertensive, antiplatelet, cardiac glycoside, antianginal drugs etc., as well as antidiabetic drugs like oral hypoglycemic and insulin are consumed and did not have medication wastage in any form. Ophthalmic preparation mainly lubricant eye drops and antibiotic eye drops were more prone to medication wastage primarily because of one-month shelf life after opening the container. Our observation was in correlation with the studies reported earlier from the different countries [38, 39]. Many families had paracetamol and other antipyretics drugs in stock as it was the most common drug used in covid and post covid era. Many members of the families were not aware about the unused medication (50.7%) and such medicines were completely out of their cognizance. 42.8% of the people had no clue about economic implications of medication wastage on the system.64% of the people were in favor of buy back policies of unused medication. Thus, it was observed that lack of awareness about medication wastage was the major contributing factor towards it. We did not find any significant relationship between medication wastage and place of storage of medicine neither with the method of procuring the medicine. It was difficult to determine the shelf life of the Ayurvedic product as most of the Ayurvedic preparation did not bear the expiry date.

CONCLUSION

Our study indicates there is potential amount of drug wastage in Goan families mainly because of lack of seriousness about the medicine. This is one of the first kind of survey depicting the status of medication wastage in Goan families. Pharmacist should actively counsel the patients while dispensing the medicine. This study will create awareness for the policy maker to think seriously about the medication wastage and make policies concern with buy back system for unused medicines. More detail robust survey is needed with large sample size and multiple variables to gain precise scenario regarding wastage of medicine and its economic impact thereafter.

IMPLICATION

Community Pharmacists and regulatory bodies like Food and Drug Administration, should work in collaboration to create awareness about medicine wastage amongst general public. Regulatory bodies should work with drugs manufacturer association to redefine the size of the medicine package which results in wastage.

LIMITATIONS

This survey has limitations of sample size. Other limitations include medication wastage in pharmacy and supply chain is not included and hence cannot predict overall extent of medicine wastage.

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ANNEXURE

SURVEY FORM

Family No Address

Name of the Head of the Family

I] Demographic, social and financial background of family

No of Family members:

Age of the members

Children Below 6 Years:

6-20 Years:

20-60Years:

Above 60 Years:

Qualification of Head of the family:

Family income: (Tick appropriate)

Below 10 thousand:

10 thousand to 50 thousand:

50 thousand to 1 lakh:

1 lakh and above:

II] Pattern of Medicine purchase and procurement (Tick Appropriate)

Online
Retail chemist
Purchased from Physician
Physicians Sample

III] Medicine Procured on advice of(Tick Appropriate)

Physician
Pharmacist
Friends/relatives advise
Social media advertisement

IV] Types of medicines available at home Number

1. Ayurvedic
2. Allopathic
3. Homeopathic
4. Siddha/Unani

V] Categories of drug available

Category of drug found in houses	Units
Respiratory drugs	
CNS Drugs	
Antibiotics	
Gastrointestinal	
Nutritional	
Musculoskeletal/joints	
Dermal preparation/ Anti allergic	
Ear/Nose/ Throat	
Cardiovascular	
Ophthalmic Preparation	
Analgesic/Antipyretics	
Antidiabetics	
Miscellaneous	

VI] Place of storage of medicines

Storage place	Number
1. Separate cabinet dedicated for medicine storage:	
2. Bedroom cupboard	
3. Near bed	
4. Kitchen	
5. Bathroom	
6. Any other place not mentioned above:	

VII] Status of medicine Number

1. Medicine in Use
2. Expired Medicine
3. Unused medicine

VIII]**Reason for not using medicine** **Number**

1. Discontinuation of medicine by the Physician or change in medication
2. Stoppage of medication after cured from symptoms
3. Experienced side effects
4. Forgot to take the medicine
5. Medicine got damaged due to improper storage