Review Article

MEDICINE STORAGE TRENDS & PRACTICES: A LITERATURE REVIEW

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Keywords: Medicines, storage, trends, practices.

Introduction

Medicines are useful for provision of better health among consumers. Safe use of medicines is still a major issue for healthcare system in developing countries [1]. Medicines are stored at home during or after their use. It is a common practice that consumers take medicines from pharmacies for treating their various forms of illness at home [2]. The effectiveness of treatment is ensured only when consumers are able to use safe and effective medicines during the whole course of treatment because the quality and efficacy of medicines is maintained when medicines are properly stored at home [4]. Knowledge of consumers is important for making decisions before, during and after using medicines along with what to do with the leftover medicines [5]. Lack of knowledge regarding storage of medicines at home promotes inappropriate storage patterns of consumers [6, 7, 8]. The inappropriate storage and use of medicines leads to the wastage of resources. Therefore, special attention must be given to consumers as they are the ultimate users of medicines and their beliefs and attitudes affect the way they use their medicines at home [9]. There is an increased trend towards purchasing both prescription and over the counter medicines from community pharmacies among consumers in developing countries [10]. In order to preserve quality of medicines, attempts are made to avoid exposure to temperature, light and humidity to maintain appropriate storage conditions according to regulations both at point of manufacture and distribution of medicines [10]. Further safe storage of medicines at point of use requires multidisciplinary approach including provision of information to consumers, addressing their beliefs and attitudes and controlling unnecessary storage of medicines through regulatory restrictions on sale of medicines [11]. The most important is the information that can be provided in counseling during dispensing process [12]. The main objective of this paper is to systematically review medicine storage trends and practices around the globe.

Methodology

The data was retrieved from electronic databases Pub Med, Google Scholar and Science direct from searched articles published from 1999 to 2016. The keywords ‘medicines storage’, ‘consumers’, ‘unused medicines’, ‘medicines wastage’ and ‘medication disposal’ were used for searching full research papers and abstracts. The bibliographies of the retrieved references were also searched. The features that describe the storage of medicines are the place of storage of medicines, duration for which medicine is being stored, the type of medicine stored and disposal of unused medicines stored at home [4]. Therefore, 82 studies covering any of these areas were included both from developed and developing countries. Data obtained from the studies included the study population demographics, knowledge and patterns of respondents regarding storage of medicines at home and potential health outcomes associated with storage of medicines. The methodologies used and target populations in some studies is summarized in (Table 1).
Table 1 Methodology of studies from some developing countries

<table>
<thead>
<tr>
<th>Year of study</th>
<th>Author</th>
<th>Country</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Al-Shareef F, et al</td>
<td>Saudi Arabia (Riyadh)</td>
<td>Twelve hundred patients were randomly selected from King Khalid University Hospital (KKUH), and King Saud University (KSU). A paper-based questionnaire with self-enumeration was used to collect data.</td>
</tr>
<tr>
<td>2015</td>
<td>Wondimu, A., et al</td>
<td>Northern Ethiopia (Tigray Region)</td>
<td>Multistage sampling was used; 1000 households were selected using systematic random sampling from randomly selected cultures of districts and regional states from Tigrey. By using structured questionnaire, the trained pharmacists collected data from adult household member (18 years) at time of data collection.</td>
</tr>
<tr>
<td>2014</td>
<td>Mahmoud S. Al-Haddad, Qasem Mahmoud Aref Abdallah</td>
<td>Saudi Arabia</td>
<td>Trained data collectors distributed questionnaire among 1446 university students who were conveniently sampled from public areas of campus.</td>
</tr>
<tr>
<td>2014</td>
<td>Gerard Lee See, Florencio Arce, Jr, Yolanda Deliman</td>
<td>Philippines (Barangay Talamban, Cebu City.)</td>
<td>A written interview questionnaire was distributed among 101 households who were sampled by systematic random sampling.</td>
</tr>
<tr>
<td>2011</td>
<td>Kheir et al</td>
<td>Qatar</td>
<td>A list of telephone numbers was generated from Qatar’s telephone directory using a systematic sampling method. Individuals consenting to participate were interviewed by 25–30-minute structured telephone interview carried out by two research assistants.</td>
</tr>
<tr>
<td>2011</td>
<td>Auta, A., et al</td>
<td>Nigeria</td>
<td>An interview questionnaire was used to collect data from 650 households selected by systematic random sampling.</td>
</tr>
<tr>
<td>2010</td>
<td>Ansam Sawalha</td>
<td>Palestine</td>
<td>Trained data collectors used structured interview questionnaire, also inspected medicines in cabinets from 465 households.</td>
</tr>
<tr>
<td>2009</td>
<td>Abdo-Rabbo, A et al</td>
<td>Oman</td>
<td>A patient exit interview by using close ended questionnaire was used to collect data from 6,675 patients or their carers on exit from randomly selected 75 primary health care centers.</td>
</tr>
<tr>
<td>2007</td>
<td>Abahussain, E.A. and Ball, D.E.</td>
<td>Kuwait</td>
<td>The data was collected by Questionnaire and face to face interview, inspection of medicines from two groups of households (total sample size 214).</td>
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</table>

Results and Discussion

Place of storage of medicines

The most common places of medicine storage such as bedrooms, kitchens and bathrooms were reported among families of Qatar, Sudan, Saudi Arabia, and New Zealand during household surveys and inventory of home medicine cabinets [4, 5, 13]. It was identified that consumers preferred such places because it was convenient for them as they find it easy to place medicines at places where they can frequently visit at any time in routine, or intend to take medicine at meal times of their ‘personal judgments’ guided.
their choice of storage place [14]. Refrigerator was identified as the most common place of medicine storage in household survey in Oman, Saudi Arabia and households of Jordan as consumers wanted to protect medicines from high temperature [4, 12, 15]. A study conducted in Nigeria reported that majority of the respondents placed medicines at places including bags, dining table, at the top of refrigerator and glove compartments of car [16]. Medicine cabinets were reported as common storage place among majority of the respondents of Croatia and Northern Arab Emirates [17,8]. Likewise, cabinets and pill containers were the most common storage location among households of Philippine [18]. Medicines storage in cabinets and cupboards was also reported from studies from Saudi Arabia and Palestine stored medicines in [4, 10]. Although, these places do not comply with the recommended storage conditions as medicines have a definite chemical nature different storage conditions are required to store different dosage forms but still [3-5,12,17,18]. Some medicines such as insulin and liquid preparations of oral antibiotics must be stored in refrigerator for maintaining their stability during shelf life [19]. Similarly, suspensions must also be stored in refrigerator [4]. However, poor storage of liquid formulations which were not refrigerated, rather placed at open shelves demonstrating the patterns of inappropriate storage was reported in Sudan [5]. Humidity, temperature and light can affect the stability and quality of stored medicines [6]. Thus, medicines placed at such locations are at risk of degradation due to exposure to high temperature in kitchen [20]. Beside this, storing medicines at multiple locations increases the chances of missed doses of medicines [17].

The safety concerns are increased if medicines are placed in access of children, even though stored in medicine cabinets [12]. Children are curious by nature and they express their curiosity at homes by roaming freely and exploring everything that can capture their attention. The appearance of medicines, particularly their colors such as pink and orange greatly attracts children [7]. Consequently; they make efforts to ingest medicines considering them as candies which actually are poisons for them. This form of unintentional poisoning is one of the major reasons for injuries among young children [21]. Different studies conducted Ethiopia, Qatar, Saudi Arabia, Palestine and Brazil reported medicines stored at home in reach of children [4,17,18,21,23]. A hospital based study conducted in Pakistan on childhood cases of unintentional poisoning concluded that majority of the children were admitted to hospitals as a consequence of ingesting medicines that were in their access [24]. The risk of poisoning could be increased if medicines are placed at height of storage places which are less than two meters, unlocked cabinets in bedrooms, kitchens and bathrooms and in the reach of young children with less than five years [25-26]. Another study conducted in Pakistan revealed that intake of medicines such as benzodiazepines, opioids, acetaminophen, aspirin and antihistamines and lack of awareness of parents regarding safe storage of medicines at home caused poisoning among young children [7].

**Duration of storage**

The duration of use through which the use of medicine offers claims of maximum efficacy and safety is limited and is specified on labels of containers by manufacturers as expiry date [27]. The studies conducted in Northern Uganda and Ethiopia and households of Palestine revealed that medicines at home were not adequately labelled, were having unclear expiry dates and without original containers [2,18,28]. On the contrary, findings from Malaysia revealed that majority of the respondents had stored medicines in original packages, but occasionally checked expiry dates of medicines [29]. However, the pattern
of checking expiry date of medicines regularly was reported from consumers of Malaysia, Saudi Arabia, and Northern Arab Emirates [4,8,30]. A study was conducted by pharmacy personnel in New Zealand with the aim to collect unused and expired medicines from consumers and to find out the extent of storage of expired and unused medicines at home. The presence of unused medicine was reported to be 62% of the collected medicines [31]. Another study from Mexico revealed that 90% of the collected expired and unused medicines stored at home were prescription only medicines [32]. Similar studies from Serbia, Ireland and United States revealed that large amounts of expired or unused medications were stored by respondents at their homes [23,33,34]. The prevalence of expired or leftover medicines at home was reported from other countries as well. In 2006, a questionnaire based survey in Kuwait revealed that 97.5% respondents had medicines stored at home which were not required [35]. In 2007, the study from households of Kuwait revealed that about 52% of the collected medicines were expired, out of which major proportion was of cough syrups [36]. Similarly, surveys investigating medicines stored among households of Croatia, Saudi Arabia, Jordan, Northern Uganda, Iraq and Malaysia, Palestine and Nigeria [2,27,28,10,33,37].

Types of medicines stored at home

The most common types of medicines encountered during surveys (Saudi Arabia, Iraq, Croatia, Jordan and Northern Uganda, Nigeria) were analgesics (paracetamol, aspirin and antibiotics) both in large amounts [2,3,4,22,28,38]. The studies conducted in Iraq, Sudan and Qatar have highlighted that large amounts of over the counter medicines and antibiotics were stored among surveyed households [3,5,17]. However, the most common medicines stored among consumers of Qatar were analgesics followed by allergy, cough and cold medicines. It was further reported that comparatively less availability of antibiotics is attributed towards strict legislations on sale [17]. In addition to analgesics and antibiotics, consumers in Malaysia and Oman also stored herbal medicines [39,40]. The other types of medicines in different households are shown in (Table 2).

Table 2 Storage and utilization patterns of medicines at home

<table>
<thead>
<tr>
<th>Study</th>
<th>Setting</th>
<th>Number of medicines</th>
<th>Utilization patterns of stored medicines</th>
<th>Most common types of medicines</th>
<th>Risks associated with storage of medicines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Current use (31%) Leftovers (45%)</td>
<td>Antibiotics (26.43 %), Antipyretic/analgesics (19.58%), NSAIDs (11.45%)</td>
<td>Self –medication (78%), poor compliance, use of drugs that have been kept beyond their expiry date</td>
</tr>
<tr>
<td>Total of 4279 with average household possessed 14.26 products ,range was 1-72 per household</td>
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<tr>
<td>Sweileh, W.M., et al,2010</td>
<td>415 household s in Palestine</td>
<td>Total of 5505 medicines , mean ± SD was 13.3 ± 7.8.</td>
<td>Regular use (35.8%) When needed (30.4%) Unused drug products (32.7%), Expired</td>
<td>Alimentary tract drug category (18.52%) Musculoskeletal (14.2%) respiratory categories</td>
<td>Wastage of medicines (19 million USD estimated nation wide drug wastage).</td>
</tr>
<tr>
<td>Authors</td>
<td>Samples</td>
<td>Medicines/Expiry Details</td>
<td>Future Use</td>
<td>Expiration</td>
<td>Other Observations</td>
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<tr>
<td>Abdo-Rabbo, A et al, 2009</td>
<td>1050</td>
<td>Average 6 medicines per household (95% surveyed household had medicines)</td>
<td>61.31%</td>
<td>12.41%</td>
<td>Musculoskeletal/joint medicines (24.91%), respiratory medicines (14.60%) cardiovascula r system medicines (12.05%). Antibiotics (45.83%) Self medication, informal channels of obtaining medicines; abundance of expired, unused or deteriorated medicines in the households, absence of proper labeling or clear instructions</td>
</tr>
<tr>
<td>M.A. Yousif, 2002</td>
<td>469</td>
<td>Total medicines were 2079, mean per household unit was 4.4</td>
<td>52.8%</td>
<td>15.2%</td>
<td>Antibiotic (22%), Analgesic (11%), Antimalarial (10.4%)</td>
</tr>
<tr>
<td>Sharif, S.I., et al, 2010</td>
<td>300</td>
<td>The average number of drugs per household unit was 6</td>
<td>47.2%</td>
<td>15.2%</td>
<td>NSAIDs (74%), Antidiabetics (14%), Antihistaminics (44%), Antihypertensive (26%), Antidiarrheal (20%) Self medication (45%), Exchange rate (86%)</td>
</tr>
<tr>
<td>Ocan et al, 2014</td>
<td>892</td>
<td>Average number of medicines was 6, and 68.1% had medicines 8-10</td>
<td>48%</td>
<td>21.6%</td>
<td>Antibacterial (40.1%)</td>
</tr>
<tr>
<td>Ali, S.E., M.I. Ibrahim, and S. Palaian, 2010</td>
<td>481</td>
<td>Medicines were stored by 93.1% students</td>
<td>77.1%</td>
<td>10.4%</td>
<td>Analgesics &amp; antipyretics (30.2%), ear, nose &amp; throat drugs (10.8%), vitamins &amp; minerals (10.8%), GIT drugs (8.5%), anti-infections (7.3%) and herbal medicines (3.5%). Self medication (80.9%), unsafe disposal practices</td>
</tr>
</tbody>
</table>
Disposal of medicines

The medicines which have passed their expiry date are not suitable for use; it is advisable to dispose off such medicines [41]. The most common methods of disposal of unused medicines stored at home among consumers of Kuwait, Qatar, Arab Emirates, Saudi Arabia, Oman, Nigeria, and Malaysia were reported as throwing medicines down to toilet or in household waste [39,17,8,12,42,43]. These are unsafe disposal practices because active ingredients of medicines which were being flushed down the sink or toilet by consumers were not processed through water treatment plants and were added as traces in water table thereby posing risks to environmental safety [44-46]. Similarly, medicines thrown in garbage are leached through landfills and become part of ground water [47]. Sudanese families disposed medicines by giving them to friends or relatives [5]. Unsafe disposal of used sharps and needles of insulin directly to waste bins among diabetic consumers has also been reported [44,45]. A comparatively safe method of disposal was suggested and followed during studies to collect unused and expired medicines. It included returning medicines to pharmacies which could be destroyed through incineration at high temperature and is less detrimental to environmental safety [48-49]. For this purpose, consumers of New Zealand, Mexico, Kuwait, were provided with collection bags for collecting unused medicines and returning to pharmacies encouraging safe disposal practices [42,41,46]. The investigation of factors that influenced disposal practices revealed that the consumers, who were aware of the detrimental effects of disposing unused medicines on environment, were more likely to return medicines to pharmacies as reported from Swedish surveys [50-52]. A study was conducted to investigate the practices and perceptions of consumers towards disposal of medicines by using questionnaire among customers visiting pharmacies of Kuwait. It was found that some consumers returned medicines to pharmacies because they thought it would be better to be used by someone else while others did so as they were convinced by the

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Azzam, S. et al., 2012</td>
<td>435 households in the North of Jordan</td>
<td>Total medicines 2835, Current use (65.3%), Unused (34.7%), Expired (5.8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nervous system medicines (25.2%), anti-infective agents (17.4%), Musculoskeletal agents (13.4%), Respiratory system agents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medication wastage (The total cost of unused medications in Jordan was estimated as 6,326,000 JD)</td>
</tr>
<tr>
<td>Abou-Auda, H.S., 2003</td>
<td>1641 households from Saudi Arabia and other Gulf countries</td>
<td>Total of 12,463 were found with mean (SD) number of medicines per household 8.0 (4.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean (SD) number of drug products unused, deteriorated, or expired was 2.2 (2.7) and 2.7 (1.9) per household Unused medicines (4.26%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respiratory medications (16.8%), Central nervous system agents (16.4%), Antibiotics (14.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wastage (US $150 million) self-medication (43.5%), sharing (20.9%), Non compliance</td>
</tr>
</tbody>
</table>
appropriateness of this method [45]. The respondents of a study from USA reported that they considered it appropriate to flush medications down to sink or toilet; however, the respondents who were counseled earlier on safe disposal of medicines were of the opinion to return medicines to the pharmacies [44]. Some consumers considered type of dosage form being important when they were going to dispose of medicines. Therefore, an online survey conducted in New Zealand identified that respondents preferred to dispose of liquid formulations to water systems, while tablets and capsules were more likely to be returned to the pharmacies [41]. In a review study regarding disposal of unused medications it was highlighted that lack of legislations and guidelines regarding disposal of unused medicines is a barrier towards safe disposal of medicines which ultimately completes the cycle of safe use of medicines among households [52]. The impact of legislations and guidelines was emphasized to improve safe disposal practices of medicines stored at home [46,8,12].

**Risks associated with unsafe storage of medicines at home**

Unsafe storage can result in poisoning, increased risk of toxicity, unsafe disposal to environment [42]. The researchers both from developed and developing countries conducted population based surveys to investigate the magnitude of medicine storage among consumers and concluded that significant amounts of medicines were stored at homes and associated risk factors were also found [2-5,18]. A high percentage (82%) of customers attending pharmacies of Tabriz, Iran reported the presence of medicines stored at home constituting mainly analgesics and antibiotics indicating trend of self-medication among consumers [26]. Both household surveys and medicine inventory modules among consumers of rural areas of Crete, Greece, Brazil, Serbian, Belgium, Switzerland revealed that large amounts of medicines stored at home were found along with indications of unsafe storage practices such as self-medication and wastage of resources [19-25]. In a study from Arab Emirates, respondents reported that they use medications from stock of medicines stored at their homes [8]. The availability of leftover medicines at homes indicates the consumer intentions for future use without seeking consultation that may result in reduced quality and effectiveness of therapy [47]. Such patterns of self medication were reported from Ethiopia, Croatia, Iraq and Northern Uganda, [2,3,18,22,43,]. The female consumers from Palestine (school teachers), from Veitnam (mothers) and from Malaysia (university students) stored leftover antibiotics for treating cough and diarrhea in future [16,39,53]. In Saudi Arabia, it was found that suspensions, meant to be discarded, were also kept for future use [4]. In Pakistan, it was found that self-medication with OTC and analgesics was associated with acquiring medicines from friends, family or using medicines previously stored at home medicine cabinets [54]. Given, the storage of large amounts of analgesics and antibiotics at home, it is quite predictable that consumers are at risks of adverse events and interactions that are inherent with concomitant unsupervised use of medicines. For example, chronic use of analgesics can cause renal failure [39]. Overuse of antibiotics results in antimicrobial resistance [3]. Using OTC medicines such as NSAIDS and antibiotics frequently and without consultation of physician increases risks of adverse effects such as hemorrhagic duodenitis and emergence of antibiotic resistance [39,55,56,57]. Unintentional exposure of such medicines to children can be a significant risk factor of accidental poisoning [23,48].

Significant relation of ethnicity was observed among Malay students who shared medicines more frequently as compared to other students from Chinese origin in Malaysia [39]. A common practice of sharing was found in children and adults with more likeliness
among girls especially for treating acne problems [59]. Sharing of medicines poses many risks to the health of consumers [60]. The reason being that a consumer would give medicine to friend or relative without dose instructions, precautions and sharing warnings associated with its safe use [59,60,61]. Some medicines have teratogenic effects, therefore, the sharing of medicines with pregnant women may cause serious complications for mother and fetus [62]. The main factor that influenced the extent of sharing medicines was that the consumers in Kuwait considered sharing medicines from household stock as an acceptable behavior [45].

**Wastage of resources resulting from improper storage of medicines**

As medicines constitute significant proportion of health expenditure, the unused medicines at home that are not fully consumed are considered as wastage of resources spent on them which may reach up to billions of dollars [28,63]. Globally, the studies investigated the extent of wastage from unused medicines stored at home and presented a quantified estimate of wasted resources from unused medicines at home and its economic impact [52]. A study was conducted at tertiary care hospitals of Oman with the objective to investigate value and type of medicines returned by patient. The estimated wastage was reported as Omani Rials (OR) 20,140 which comprised largely of anti-infective and cardiovascular medicines [48]. Similarly the reports of estimated wastage were found from Saudi Arabian homes as national medication wastage of USD 150 million, from households of Egypt total cost of 49507.2 LE (8348.5 $) was reported, from Palestine it was about 19 million USD nationwide [64-65]. Another survey in Palestine investigated wastage with antibiotics stored at home. The estimated total cost of antibacterial agents found in the study was $4,769, approximately $11.5 cost per household. The total wastage on antibacterial agents was reported as$2,790 making it to approximately $6.7 per household [33]. Similar study was conducted among households of Jordan. It was found that a cost of 6,326,000JD was incurred on unused medicines stored at home, while expired medicines constituted an estimated cost of 1,267,000 JD [28]. A potential medication wastage of 53.8% was found among households of Iran with medications stored at home [9].

**Factors affecting storage of medicines at home**

There are some factors that affect the storage of medicines at home. These include demographics of respondents, perceptions and beliefs, knowledge regarding storage. An increased pattern of unsafe storage of medicines was found among elderly consumers, consumers with low education level as in households of Iraq, Sudan, Nigeria and Northern Uganda, higher level of education among Palestinian, Malay and Saudi Arabian consumers [10,39,4,66.67]. However, in Arab Emirates, level of education of consumers had no influence on storage of medicines at home [8]. The studies from United kingdom, Malaysia and Saudi Arabia showed that younger individuals and females were more likely to store medicines at home [39,68-72]. Mothers from Iranian households and Rural communities of Vietnam, having dominating role of mothers in managing health related issues at home stored antibiotics for future use [9,16,73]. It was reported from various studies that unsafe storage of medicines was found to be associated with noncompliance of consumers, when consumers stop taking medicines either because of side effects or when they feel better from illness [74-75].

Another factor reported was overprescribing of antibiotics by physicians, change in regimen or treatment modifications as reported by the respondents Egypt, and Kuwait [76-
In developing countries, there is an increased trend among consumers towards purchasing both prescription and over the counter medicines from community pharmacies, which is considered as convenient and economical source for supply of medicines [13]. The unchecked sale of medicines to the consumers with inadequate knowledge raises the possibility of medicines to be part of home medicine cabinets which later becomes source of treatment for households indicating self-medication [47, 79]. The availability of free of charge medicines in some countries may also cause an increased number of stored medicines at home such as in Oman and Kuwait [45, 48].

The safe storage of medicines is largely affected by the quality of information provided to the consumers [15, 16]. It includes both written such as labels of medicines and verbal source of information such as counseling by physician and pharmacists [12, 80]. It was found in Ethiopia that respondents following inappropriate storage patterns were not having knowledge of recommended storage conditions [18]. The respondents from Nigeria and India were aware of the fact that improper storage of medicines badly affects their quality and thus makes medicines unfit for subsequent use by consumers yet inappropriate patterns were followed because of lack information regarding proper storage of medicines at home [31, 74]. The results of household surveys investigating storage of medicines at home revealed patterns of improper storage of medicines among consumers of Qatar, Iran, and Philippine, even though, physicians were reported as major source of information regarding storage [17, 26, 32]. However, some (29%) of the respondents identified pharmacists as source of information regarding storage among families of Saudi Arabia [4]. Lack of information regarding safe disposal practices was reported from Kuwait Nigerian families and Saudi Arabia [31, 46, 82]. It was recommended that public education involving pharmacists should provide necessary information regarding storage of medicines at home and safe disposal practices to consumers [18, 32, 4, 5, 31, 17]. In fact, it is the responsibility of pharmacist to provide instructions on storage of medicines to consumers [32]. It must be ensured that consumers understand well the instructions on label regarding medicine use [79]. For example, pharmacist must explain that what it means by instruction “keep at cool place”. The places at home should be identified where conditions of cool temperature are fulfilled. It should also be elaborated that placing medicines in windows expose them to sunlight. The instructions regarding safe storage can also prevent cases of poisoning [7]. Further, the term “keep away from reach of children” should be explained by suggesting that keeping medicines should be kept at height and in locked cabinets. Pharmacist should warn consumers to place caps of bottles after use, never leave medicines unsupervised to avoid cases of accidental poisoning. The physicians assume that patients will receive instructions from pharmacist, while pharmacist must not assume that customer has knowledge regarding quality use of medicines [81-82]. In some countries the educational campaigns were conducted and the role of pharmacists was acknowledged in promoting safe storage of medicines at home. These educational campaigns included displaying posters in waiting areas in hospitals having information and instructions regarding safe disposal of medicines by returning them to pharmacies [82]. Student facilitated education program on the knowledge of patrons attending community pharmacies in Scotland [65]. Pre and post intervention for pharmacist were found as an effective tool in promoting appropriate use of medicines and thus preventing the wastage [71]. Moreover, drug use assessment programs and comprehensive evaluation of national policies can reduce wastage from medicines stored.
at home [9].

Conclusion
The review concluded that consumers store a good number of medicines inappropriately at different places including bedroom, kitchen, on shelves and in reach of children at home. This reflects that consumers are not well informed regarding proper storage of medicines at home even at point of purchase. Such inappropriate practices could also lead to irrational drug use like accidental poisoning by children, self-medication, sharing of medicines, unsafe disposal harming environment resulting in wastage of resources spent on medicines from manufacture to delivery. There is strong need to provide legislative support in terms of restriction on sale of POM medicines. Participative role of pharmacist can help improve safe storage and use of medicines at home and ensure effectiveness of therapy.

References


