Qualitative assessment of caustic soda injury in Liberia

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ABSTRACT

Objectives This study explored lye (caustic soda, sodium hydroxide) use in Liberia, knowledge about its risks and injury prevention programmes.

Design A qualitative semistructured interview study.

Setting Focus groups occurred in six Liberian counties between April and August 2016.

Patients Two previously identified stakeholder groups included parents of children under 5 years and adults identifying as soap makers.

Interventions Interview guides were written. Participants were recruited by convenience and snowball sampling. Transcribed audio-recorded discussions were analysed using the constant comparative approach.

Main outcome measures Participants were enrolled until thematic saturation was reached.

Results Ninety-six adults participated. Participants described how lye entered the home, its use, storage, lye-related injuries and treatments, and injury prevention programmes.

Conclusions Lye is commonly used and stored in Liberian homes despite recognition of its danger. A successful injury prevention programme must interrupt this cycle and find programming and legislative change to which the community is receptive.

INTRODUCTION

Lye (caustic soda, sodium hydroxide) is ubiquitous in West Africa and remains a devastating cause of morbidity and mortality in Liberia. In liquid form, it is easily mistaken for water. A strong alkali, rapid, extensive injuries to the oropharynx, upper airway and oesophagus result if ingested. Lye is commonly used and stored in Liberian homes, making it amenable to community and governmental involvement for caustic soda injury prevention.

What is already known on this topic?

► Lye is a common household cleanser and ingredient in soap production in West Africa.
► In powder form, it looks like salt or sugar and in liquid form it is odourless, tasteless, colourless and easily accidentally mistaken for water.
► Lye is a devastating cause of morbidity and mortality in West African children.

What this study adds?

► Parents of young children and soap makers are generally aware of the risks associated with lye.
► Despite recognising the risk of caustic soda injury, parents of young children and soap makers often continue to store lye in their homes.
► Parents of young children and soap makers are amenable to community and governmental involvement for caustic soda injury prevention.

Parents were recruited from immunisation clinics. Soap makers were recruited from marketplaces and asked to refer other soap makers. Subjects were >18 years, resided in Liberia and spoke colloquial Liberian English. The a priori goal was 8–12 participants per group. Verbal consent was obtained from all participants. Zero participants dropped out.

Interview guide

The investigative team included three Liberian nurses and two American physicians and one Liberian nurse. The team wrote two interview guides with question and prompts informed by the literature and their experience with lye ingestion. Categories included: practices around lye purchase, use, storage, knowledge and experience with lye injury, and injury prevention strategies. Soap makers were asked to discuss their training and the soap making process.

Data collection

The study team underwent formal focus group training by field experts. SW-C facilitated each session using the appropriate interview guide (online supplemental appendix 1). Participant demographics, whether lye was stored at home and the number of rooms in their house were collected.

Most participants agreed vendors should not sell lye to children but noted no laws to that effect and that children could buy it.

**Lye storage**

Participants reported storing lye crystals or powder in plastic bags. Liquid lye was stored in bottles, buckets and barrels. Participants often hid the lye. Participants recognised storing lye at home carried risk.

**Soap preparation**

All soap makers and some parents made soap. Formal soap production training was more common among soap makers and often provided by non-governmental organisations. Many participants learnt from family or friends.

Both groups reported preparing soap at home. Some used a dedicated room. Others used shared spaces. Soap makers reported using dedicated facilities more often.

Both groups highlighted the importance of personal protective equipment and noted it was stressed in formal and informal training.

**Lye injury**

Subjects in both groups shared accounts of lye injury from inhalation, topical exposure and ingestion. The victim frequently mistook lye for water and drank or washed with it. Burns from spills were also described. Intentional exposures included attempted and completed suicides or use to harm others. The reported outcomes were generally poor. Many died from their injuries or of malnutrition due to inability to swallow.

**Home remedies**

Participants discussed washing lye off with water, lime and/or oil. Salt, milk, oral rehydration fluid, coconut water, flour, raw eggs and cassava leaves were also mentioned as home remedies. Participants discussed washing lye off with water, lime and/or oil. Salt, milk, oral rehydration fluid, coconut water, flour, raw eggs and cassava leaves were also mentioned as home remedies. Participants recognised storing lye at home carried risk.

**Informing a prevention programme**

There was consensus that children should never handle lye. Participants in both groups voiced that lye should not be stored at home and if it is should be locked up. Participants from both groups advised those making soap as their primary job to consider other occupations.

Participants proposed government intervention to promote knowledge about caustic injury, provide safety training and build communal soap making facilities. They supported legislation to prohibit selling lye to minors, limit soap production in homes and establish a licensing requirement for soap makers. Violations, they proposed, could be penalised monetarily.

**DISCUSSION**

This study explores the knowledge about and use of lye in Liberia as a stepping-stone towards an injury prevention programme. The participants described how lye enters the home, reviewed storage practices and knowledge about its risks, and discussed its usual use (figure 1).

Unlike Botwe et al’s study in Ghana where knowledge of the hazards of lye was limited, awareness of the risk of lye injury was almost universal in our study. Nevertheless, parents and soap makers continue to store lye at home. This indicates that interventions that focus solely on risk education are insufficient.

### Table 1 Demographics of study participants

<table>
<thead>
<tr>
<th></th>
<th>Parents of children &lt;5 years</th>
<th>Soap makers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total subjects</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>Female gender (%)</td>
<td>45 (97.8)</td>
<td>40 (80)</td>
</tr>
<tr>
<td>Mean age in years (SD)</td>
<td>22.7 (5.3)</td>
<td>35.6 (11.2)</td>
</tr>
<tr>
<td>Education (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>6 (13)</td>
<td>18 (36)</td>
</tr>
<tr>
<td>Any primary school</td>
<td>11 (24)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Any secondary school</td>
<td>29 (63)</td>
<td>31 (62)</td>
</tr>
<tr>
<td>Children &lt;5 years in home (%)</td>
<td>46 (100)</td>
<td>39 (78)</td>
</tr>
<tr>
<td>Number of rooms in the home (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3 rooms</td>
<td>18 (39)</td>
<td>26 (52)</td>
</tr>
<tr>
<td>≥3 rooms</td>
<td>28 (61)</td>
<td>24 (48)</td>
</tr>
<tr>
<td>Caustic soda stored in home (%)</td>
<td>5 (11)</td>
<td>34 (68)</td>
</tr>
</tbody>
</table>
Participants in both groups supported government regulation of lye. A careful examination of how lye enters and is then used, stored in and exits the home is key to consider what these regulations should be.

Regulating lye storage may prevent injuries. Fatal injuries from caustic ingestion are rare in the USA following the Poison Prevention Packaging Act of 1970 which mandated childproof containers and the labelling of potentially harmful household products. Similar laws may not have the same impact in Liberia due to the challenge of regulating informal markets. A socioeconomically viable solution must be sought, and local communities will need to be engaged to make real change.

CONCLUSION
Lye use has multiple opportunities for accidental exposure and potential for intervention. Parents and soap makers are aware of lye’s dangers and support the idea of prevention programmes. Further information is needed to develop successful intervention programmes and to lobby the government and local and international organisations to support those efforts.

Contributors JZ, KAC, MK-B, SW-C, LG and AMV conceptualised and designed this study. JZ, MK-B and SW-C conducted the focus groups. Data were analysed and interpreted by JZ, AMV, MK-B, SW-C and KAC. The final manuscript was written by JZ, AMV and KAC. Final edits were made by and approval granted by all of the authors. All of the authors agree to be accountable for all aspects of the work.

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