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.

We aimed to describe knowledge about lye, examine its use and explore culturally acceptable injury prevention strategies.

MATERIALS AND METHODS

Design and study setting

Semistructured face-to-face focus groups were conducted with two stakeholder groups. Focus groups were held in six Liberian counties in communities accessible by road from Monrovia during the rainy season.

Participants

Two stakeholder groups were identified: parents of children under 5 years at risk of lye injury and self-identified soap makers who may be affected by lye injury prevention programmes. Recruitment was by convenience and snowball sampling.

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.
by written questionnaires. Sessions occurred April–August 2016. Sessions were audio recorded and lasted 2–3 hours. No field notes were taken. Participants were provided refreshments and a $5 phone card.

Data management and analysis
SW-C and Liberian medical students transcribed the session recordings verbatim. Transcripts were imported into NVivo Qualitative Data Analysis Software program (V.11 and V.12, QSR International, Melbourne, Australia). Data were reviewed for new themes while focus groups continued. Data collection ceased when thematic saturation was achieved after 12 focus groups. Transcripts were analysed by the constant comparative technique. A preliminary coding scheme based on the interview guide was applied to the first two transcripts from each group. Open coding procedures allowed new theme identification and coding scheme revisions. Five team revisions occurred. Six of the 12 interviews required recoding with the finalised coding scheme to reach standard intercoder reliability (κ >0.6) for all nodes. Each transcript was coded by one Liberian team member (JZ or MK-B); 42% of the transcripts were double coded, 25% were triple coded.

RESULTS
Twelve total focus groups occurred, six in each group, with a total of 96 adults participating (Table 1).
Themes are presented in six categories: lye use, acquisition, storage, soap preparation, injury and prevention programmes (online supplemental material).

Lye use
Lye is used to make different soaps including washing, laundry and bathing soap. Soap making from lye served as a reliable income source and home-made soap was identified as affordable. Participants used lye to clean the bathroom, wash clothes, relax hair and bleach skin. Less common uses included use as a tie-dye agent, pesticide or for pedicures.

Lye acquisition
Lye is purchased in stores and markets as crystals, powder or liquid. At the time of research, 25 kg of crystal lye sold for ~US$25.00 and could make 1500–1800 bars of soap which would sell for US$150–US$175.

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 recognised that severe injuries should be managed at a hospital.

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.

Funding Funding for this study was obtained by AMV and KAC from the Melissa Ketunuti Memorial Global Health Fund at the Children’s Hospital of Philadelphia.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The protocol was approved by the Institutional Review Boards at the University of Liberia and the Children’s Hospital of Philadelphia.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data sharing not applicable as no datasets generated and/or analysed for this study.

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