PROFILE OF DRINKING BEHAVIOUR AND COMPARISON OF SELF-REPORT WITH THE CAGE QUESTIONNAIRE AND CARBOHYDRATE-DEFICIENT TRANSFERRIN IN A RURAL LESOTHO COMMUNITY

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(Received 21 August 2000; in revised form 14 November 2000; accepted 18 December 2000)

Abstract — This paper aims to: (1) profile the drinking behaviour of a rural Lesotho community facing relocation; (2) compare the following measures of hazardous drinking in this community: quantity/frequency self-report, the CAGE questionnaire and carbohydrate-deficient transferrin (CDT) levels; (3) describe community awareness of, and attitude towards, treatment services. As part of a larger baseline survey of community health status, households in 29 villages in Lesotho were randomly sampled. Consenting adults (n = 348) participated in a face-to-face interview about alcohol use, which included the CAGE. Blood was taken from participants for CDT determination. Fifty-three per cent of men (37/69) and 19% of women (53/279) reported drinking alcohol. Thirty-six per cent of men (25/69) and 9% of women (25/279) were classified as hazardous drinkers defined as drinking 350 g (males) or 225 g (females) of alcohol/week, or ‘engaged in bouts of heavy drinking 1 to 2 days a month or more during the past 12 months’. Hazardous drinkers were significantly more likely to be male and older, but did not differ from the rest of the sample on marital status. Using hazardous drinking as the standard, CAGE (score 22) had a positive predictive value (PPV) of 75% for men and 62% for women. The parameters for CDT must be interpreted with caution as the cut-offs for hazardous drinking, especially for women’s drinking, were lower than the usual cut-offs in published CDT studies. However, the high specificities for CDT in men (100%; 19/19) and in women (77%; 110/142) are consistent with other studies, but the low PPV of 14% (5/37) for men and women combined suggests that CDT is not effective as a predictor of hazardous drinking in this population. There was high awareness of available treatment services among participants, and most believed treatment to be beneficial. Overall, the study provides a comprehensive baseline profile of drinking behaviour in this community, but did not show the CAGE questionnaire or CDT profile to be useful in in this community.

INTRODUCTION

Knowledge of the prevalence of alcohol use and misuse in a community should form the foundation for planning and implementing intervention programmes in that community. Both quantitative and qualitative data can provide useful information leading to the appropriate targeting of such programmes, ranging from prevention and health promotion through to treatment services. Baseline and regular follow-up studies of drinking patterns are also important as a means of evaluating the impact and effectiveness of such interventions. Additionally, such studies are likely to provide useful indicators by which the impact of changes to the social and economic framework of a community can be measured.

Self-report of drinking is of doubtful accuracy in surveys as heavy drinkers tend to under-report (Conigrave et al., 1995; Wetterling et al., 1998). In addition, a comprehensive drinking history usually requires a trained interviewer and can be time-consuming, further limiting its usefulness. The development and evaluation of brief screening instruments, such as the four-item CAGE questionnaire, has helped in this area (Mayfield et al., 1974). The CAGE has good internal reliability and has been used widely across the world (Dawe and Mattick, 1997). However, the validity of the CAGE in different cultural and language settings has been questioned (Indran, 1992). Many researchers fail to recognize that the CAGE reflects lifetime drinking problems, rather than recent alcohol consumption, and is more sensitive to alcohol dependence than to less severe drinking disorders (Fiellin et al., 2000).

This has important implications for studies that compare it with recent quantity–frequency consumption reports and biological markers. Accurate and reliable biological markers to identify both those who are alcohol dependent and those who are at risk for harmful or hazardous drinking in a community are highly desirable (Aithal et al., 1998). Mean corpuscular volume (MCV) and gamma-glutamyl transferase (GGT) have been used extensively to measure long-term alcohol use, but elevated levels do not always indicate alcohol use (Sillanaukee, 1996). Over the past decade, carbohydrate-deficient transferrin (CDT) has been proposed as the most reliable marker of chronic alcohol consumption (Stibler, 1991; Mikkelsen et al., 1998; De Feo et al., 1999). Studies have shown that CDT is a better marker for alcohol dependence than for actual consumption levels (Mikkelsen et al., 1998; Mundle et al., 1999). There is some evidence that CDT is not a useful marker in females (Gronbaek et al., 1995; Huseby et al., 1997), although investigators of these studies acknowledged that the low numbers of participating women could have affected the accuracy of their results. Mundle et al. (1999) found that CDT was significantly more sensitive in subjects who had a duration of abstinence of less than 4 days before blood testing, than those with a longer duration of abstinence. Recent research suggests that low iron status or high iron demand may elevate CDT levels (Van Pelt and Azimi, 1998; De Feo et al., 1999). The influence of age on the test is currently equivocal (Huseby et al., 1997; Agelink et al., 1998). To date, most studies using CDT have been conducted in clinical settings, with lower sensitivities reported in general population settings (Gronbaek et al., 1995; Huseby et al., 1997). Findings conducted in the developed world may not be generalizable to rural communities living in the developing world and little is known about possible

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racial variation of CDT levels (Conigrave et al., 1995; Wickramasinghe et al., 1995).

Our aim in this paper is three-fold: (1) to profile the drinking behaviour of a rural Lesotho community; (2) to compare the usefulness of the following measures of alcohol misuse in this community: self-report of quantity and frequency, the CAGE questionnaire and CDT levels; (3) to describe community awareness of, and attitude towards, treatment services.

Background to the Lesotho Highlands Water Project

Lesotho is a small mountainous country, entirely surrounded by South Africa. From 1884 until independence in 1966 Lesotho was a British protectorate (Mphi, 1994). It is populated by just over 2 million Basotho people, many of whom maintain a traditional agricultural lifestyle in the mountains. The Lesotho Highlands Water Project (LHWP) is a massive hydro-electric scheme established to generate electric power for Lesotho and for the sale of water to South Africa. It is jointly funded by South Africa, Lesotho, the European Investment Bank and the World Bank, and has involved the building of dams, bridges, roads and tunnels. This has required the relocation of several communities due to the inundation of their villages and surrounding areas by water.

During the construction of a dam in the Mohale area of Lesotho, the Lesotho Highland Development Authority commissioned a health impact assessment to provide baseline information on the living conditions and health of the communities to be affected by the construction programme, both for the purposes of planning for future health and welfare needs of the communities and for monitoring the health impacts of the construction programme. The Medical Research Council (MRC) of South Africa and its partners were contracted to undertake the baseline assessment of the health of the residents living in and around the environs of the proposed dam.

METHODS

The study area covered 400 km² of rugged mountainous terrain, of which 10 km² is arable land and 15 km² of grazing land were to be inundated. The study population comprised ~7500 people living in 83 villages, of which 17 villages were to be completely inundated. Twenty-nine villages were randomly chosen to be surveyed. The sample included villages to be completely inundated, those that were sited within 2 km of the proposed construction and those that were not under threat of flooding nor near the construction site. The sample was weighted in favour of the more seriously affected areas and in favour of the larger villages. From a previous socioeconomic survey, it was determined that there was no significant difference in socioeconomic status between larger and smaller villages, and so it was assumed that minimal bias would be introduced by this sampling method. Within each of the 29 villages sampled, approximately half the houses were sampled.

The field work was contracted to a private research organization, Sechaba Consultants. Two research teams, each comprising a team leader, a public health nurse, a research assistant and a community health worker where possible, conducted face-to-face interviews with members of each household sampled. All the field workers had previous data collection experience and had received training in conducting interviews from Sechaba Consultants and the MRC. They were all Basotho.

Consent for household participation in the study was requested from the household head or principal caregiver. After the household head or caregiver had given permission for the study to proceed, formal written consent was obtained from each adult (aged over 16 years) who consented to be interviewed. Therefore, in some households more than one adult participated. The face-to-face interview covered a broad range of health issues and included questions about alcohol use and misuse.

The alcohol section of the interview was developed by two of the authors (C.P. and N.M.), translated into Sesotho and back-translated into English. Twenty questions focused specifically on alcohol and included whether the person drank alcohol, the nature of his or her drinking (e.g., alone or as part of a celebration), the last time alcohol was drunk, the time of day alcohol is typically drunk, the number of days per week that the participant typically drinks, the drinking history during the past 7 days, the type and amount of alcohol drunk on a typical drinking day, and the length of time spent drinking on a typical drinking day. As it was anticipated that many participants would describe drinking traditional home-brewed beer which is packaged in a variety of containers of different volumes, provision was made for participants to specify the exact containers used.

The four questions of the CAGE questionnaire were included. Additional structured questions asked participants which treatment services they would access should they have an alcohol problem (a menu of available services was provided), and if so, how accessible these services were; whether they would be able to afford treatment, and whether they believed treatment would be successful.

Definition of hazardous drinking

Using the quantity and frequency information obtained during the interview, we defined a person with hazardous drinking as all those consuming more than 350 g (males) or 225 g (females) of alcohol/week, in accordance with previous studies (Bohn et al., 1995: Wetterling et al., 1998). Participants who indicated that they engaged in bouts of heavy drinking 1–2 days a month or more during the past 12 months were also included in the definition of hazardous drinkers. This definition allowed for the inclusion of people who were likely to be alcohol dependent and those who engaged in early-stage harmful or hazardous drinking (Bohn et al., 1995). It did not differentiate between them.

Procedures for CDT collection and analysis

Each adult who consented had three 5 ml vials of blood taken for measurement of syphilis, hepatitis B and HIV status, and nutritional indicators which included CDT. The tubes of clotted blood were stored at 4°C and transported daily to the field station where the tubes were centrifuged at 2500 r.p.m. for 10 min and the serum decanted into labelled 5 ml plastic tubes and stored at –20°C. The samples were transported twice weekly to Maseru, the capital of Lesotho, before being transported to the South African Institute for Medical Research in Johannesburg for analysis. Kabi
Pharmacia sponsored the kit, CDTect®. The cut-off points recommended by the manufacturer were used: for males >20 U/l; females >26 U/l.

Statistical analysis

Statistical analysis was performed using an SPSS program package. Associations between categorical variables were examined using \( \chi^2 \)-tests. Dimensional variables were analysed using \( t \)-test (two-tailed) when appropriate. Alpha was set at 0.05.

RESULTS

On a few occasions, hostility from some villagers made it impossible to interview all selected households. No information is available on how many households sampled refused access to the interviewers and had to be substituted. It is also not known whether refusals were likely to be any different from those who consented. In total, 395 households were sampled. Three hundred and forty-eight adults completed the alcohol use questionnaire.

Descriptive details of the participants can be seen in Table 1. Eighty per cent (279/348) were women and 76% (266/348) were sampled. Three hundred and forty-eight adults completed the alcohol use questionnaire.

Of those who drank alcohol, almost half (41/87) drank twice a month or less often, 29% (25/87) drank on 1–2 days a week and 24% (21/87) drank on 3 days a week or more often, with 10% (9/87) drinking every day. Sixty-five per cent of the sample reported drinking traditional home-brewed beer exclusively, 15% drinking Western beer exclusively and 20% drinking both Western and traditional beer (data available from 72 cases). One person reported drinking spirits and one person cider as a second drink of choice after Western beer.

The daily volumes of traditional beer that were consumed on a typical drinking day ranged from 340 to 10 000 ml with a mean (SD) of 2634 (± 1737 ml). This was not significantly different for men and women (\( t = 1.72; \) df = 64; \( P = 0.09 \)). Daily volumes of Western beer consumed ranged from 750 ml to 9000 ml with a mean of 3377 (± 2310 ml). There was no significant sex difference (\( t = 1.90; \) df = 56; \( P = 0.06 \)).

Hazardous drinking

According to the definition of a hazardous drinker described in the Methods section, 25 males and 25 females were classified as ‘hazardous drinkers’ (36% of all men and 9% of all women). Men were significantly more likely to be classified as hazardous drinkers than women (\( \chi^2 = 32.45; \) df = 1; \( P = 0.000 \)). The hazardous drinkers were significantly older (37.2 ± 7.9 years) than the rest of the sample (31.5 ± 8.8 years) (\( t = -4.17; \) df = 341; \( P = 0.000 \)). There was no significant difference in marital status between the hazardous drinkers and the rest of the sample (\( \chi^2 = 0.45; \) df = 1; \( P = 0.50 \)). Four of the 27 participants who described brewing beer as their main occupation were classified as hazardous drinkers.

CAGE questionnaire

Fifty-five per cent of the 78 drinkers on whom CAGE data were available scored above the commonly recommended cut-off value for the CAGE (score ≥2). Of those who were classified as hazardous drinkers, 67% (33/49) scored above the cut-off score for the CAGE. Of those drinkers who were not classified as hazardous drinkers, 58% (17/29) also scored above the cut-off score. The sensitivity, specificity and positive predictive values for the CAGE in the sample of drinkers were calculated, with hazardous drinking being used as the standard (Table 2).

CDT levels

A total of 181 participants consented to have blood taken for CDT measurement. The mean CDT level for women...
These requiring more than 24 h travelling time. Forty-five per cent of all participants required 2 h or less to reach their preferred treatment service. There was no significant difference between hazardous drinkers and the rest of the sample in reporting access to treatment.

Approximately two-thirds (226/344) of all participants stated that they would be able to afford treatment for an alcohol problem, 15% would not be able to afford it and 20% were uncertain. The majority (77%; 266/344) believed that the treatment services would be successful in their treatment, 3% did not, and 19% were uncertain. Hazardous drinkers did not differ significantly from the rest of the sample in reporting affordability of treatment or treatment success.

**DISCUSSION**

This study is one of only a few to research and document alcohol consumption patterns in remote communities in Africa. Given that the findings are from communities due to be relocated in the face of a large construction programme, the results should be viewed in this context and may not be generalizable to other rural settings. The sample was weighted in favour of villages that were to be completely flooded. The researchers’ intention was to focus on those villagers who were most affected by the construction and to collect baseline data for future comparison purposes. However, a survey of a similar Lesotho community which was not under threat of relocation and which would serve as a control would have increased the generalizability of the results.

The sample was biased towards female participants. This was to be expected, as men in Lesotho tend to migrate to South Africa for long periods of time in search of better paid jobs, leaving the women to shoulder the major family and economic responsibilities at home (Mphi, 1994). Although this limits our interpretation of the findings for males, it does provide a comprehensive picture of the experience of women living in rural communities. Most of the participants were younger than 40 years, reflecting the typically higher mortality and fertility of a developing country population. It is notable that after household work, the most common occupation described is the brewing of beer. Until white farmers and settlers arrived in this part of Southern Africa in the early 19th century (Meursing and Morojele, 1989) low-alcohol sorghum beer was the only alcoholic beverage available to Basotho people. Consumption of this brew was restricted to adults, governed by strict behaviour norms, and drunk only on special occasions. According to local culture, women are discouraged from drinking. However, 19% of the women in our study admitted to drinking alcohol. More consistent with traditional norms was our finding that 58% of the women last drank at a feast or celebration, compared with only 20% of the male drinkers.

The finding that 75% of the male drinkers reported last drinking ‘on no particular occasion’ confirms the rapid shift away from traditional drinking patterns described by Meursing and Morojele (1989). They ascribe this change largely to aggressive and widespread advertising of alcohol and an expanding range of available alcohol products. However, traditional beer was the drink of preference for most participants in our sample, reflecting the rural setting and high costs and limited

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**Table 2. Sensitivity, specificity and positive predictive values of the CAGE for problem drinking in drinkers**

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<tr>
<th></th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>Positive predictive value (%)</th>
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<tbody>
<tr>
<td>Males (n = 34)</td>
<td>50</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>Females (n = 44)</td>
<td>84</td>
<td>32</td>
<td>62</td>
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Sensitivity = true positives/(true positives + false negatives).
Specificity = true negatives/(true negatives + false positives).
Positive predictive value = true positives/(true positives + true negatives).

(n = 157) was 21.11 (± 6.27 U/l) and for men (n = 24) 15.94 (± 4.52 U/l). Thirty-seven (20%) of the 181 participants had elevated serum levels (women >26 U/l; men >20 U/l). The rate of elevated CDT levels was higher in females (28.6%) than in males (9.0%), but this was not statistically significant.

A comparison of participants’ CDT levels and their reported drinking rates revealed that 20% of those who stated that they never drank alcohol at all and who consented to having blood taken for CDT measurement (n = 141) had elevated CDT levels. All were female. CDT levels were raised in 25% of those who stated that they drank alcohol and consented to having blood taken (10/40). Five of the 20 participants who were classified as hazardous drinkers and who consented to venepuncture had elevated CDT levels.

We assumed that all those who reported not drinking and who had CDT levels assessed would report amount and frequency scores equal to zero and therefore not be classified as hazardous drinkers. We then calculated the sensitivity, specificity and positive predictive value of CDT on the sample of participants who had CDT levels assessed (n = 181). These can be seen in Table 3, where hazardous drinking is the standard.

**Treatment services**

Thirty-six per cent (125/348) of the participants indicated that they would visit one of the two residential rehabilitation clinics if they were to have an alcohol problem. Twenty per cent would go to the nearest general hospital or clinic, 4% would visit a traditional healer and 1% a doctor. Six per cent believed they would give up alcohol voluntarily instead of visiting a treatment service, and 30% did not know where they would go for help with an alcohol problem.

Half of the participants (179/347) reported that reaching treatment facilities would be difficult or very difficult for them. Thirty-six per cent (127/346) of the participants would require longer than 4 h to reach their destination, with four of
availability of Western alcohol products. A greater median volume of traditional beer was consumed than Western beer. This difference in volumes consumed can be explained by the difference in alcohol content, with traditional beer having ~3% alcohol content and Western beer having 5% alcohol content (Wolmarans et al., 1993). As the alcohol content of traditional beer varies from brew to brew, and brewer to brewer, quantifying the actual alcohol content per volume can only be approximate. We deliberately chose a conservative definition to quantify hazardous drinking to minimize over-estimating hazardous drinking due to this variability.

Prevalence of hazardous drinkers among our sample was 9% for women and 36% for men. This difference in rates between men and women is consistent with other Southern African studies of risky drinking, which show alcohol consumption rates to be 15–20% higher for men than women (Parry and Bennetts, 1998). Currently, there are few comparative data available for patterns of drinking among adults in rural communities, as most studies have been conducted in urban or peri-urban areas and many focus on young people of school-going age. Despite the lack of comparative data, we believe the prevalence patterns found in our study are alarmingly high. This high rate may be due to stressors impacting on the community, as a result of imminent relocation and disruption of traditional lifestyles. Hazardous drinkers were more likely to be male and older than other participants. This is again consistent with what would be expected in a community where younger, able-bodied men leave to seek work elsewhere.

The sensitivity of the CAGE to detect hazardous drinking was poor in men, but high in women. However, this was reversed for specificity. As drinking is culturally unacceptable for women, the high proportion of false-positives in women may be because they are more likely to under-report their consumption and/or because they are more likely to answer ‘yes’ to the CAGE question: ‘Have you ever felt guilty about your drinking?’ The positive predictive value (PPV) of the CAGE was lower for women (62%) than for men (75%). With hazardous consumption as the gold-standard, the CAGE is not appropriate for screening women in this setting.

The sensitivity and specificity recorded for CDT must be interpreted with caution, due to the low numbers of males in the sample. However, the high specificities for both men (100%; 19/19) and women (77%; 110/142) is consistent with other studies (Aithal et al., 1998; Wetterling et al., 1998). The low PPV of 9% (3/35) for women and 14% (5/37) for men and women combined suggests that CDT is not effective as a predictor of hazardous drinking in this population. However, the cut-off for drinking, especially for women’s drinking, was lower than the usual cut-off in published CDT studies.

The fact that 20% (28/141) of those who stated that they never drank alcohol at all had elevated CDT levels is of interest. All of these were women. Although CDT has been shown to be a poor measure of alcohol consumption in women (Gronbaek et al., 1995; Huseby et al., 1997), the following reasons may be especially relevant in our sample. Firstly, depleted iron stores may raise CDT levels (Van Pelt and Azimi, 1998; De Feo et al., 1999). In deprived rural communities with poor nutritional status, such as the communities in this study, many women of child-bearing age may be iron-deficient with resultant raised CDT levels. Unfortunately, we cannot give CDT as a percentage of total transferrin, which might have clarified this point, because total transferrin was not measured. Secondly, as this is the first study to measure CDT levels in a black African population, the cut-off points for CDT may be inaccurate and further research is required to determine appropriate levels.

We are encouraged by the finding that there was a relatively high awareness of available treatment services specific to alcohol problems. Even more encouraging is the finding that most participants believed they would not only be able to afford treatment, but that treatment would be successful. Although these findings cast the Lesotho health system in a positive light, it is a matter of concern that 36% of participants require longer than 4 h to reach these treatment services. This is largely due to the surrounding rugged terrain and lack of transport services in the area. Based on the fieldworkers’ knowledge and experience, it is our opinion that it would take most participants a day to reach the facilities and that treatment at the designated alcohol treatment facilities would be too expensive for most. The construction of roads as a result of the LHWP will potentially improve the villagers’ access to treatment services.

Throughout Africa and the developing world, the traditional lifestyles of many communities are threatened by construction programmes similar to the LHWP. Our study achieved its goal of providing a baseline profile of the drinking behaviour of a rural Lesotho community facing such forced lifestyle changes. Alcohol use patterns can provide an indication of the underlying health of a community. It will be important to monitor the drinking patterns of adults in this community over time, to determine if changes occur in response to relocation and the disruption of traditional lifestyles.

Acknowledgements — The authors thank Sechaba Consultants, the research teams for their field work and data entry, Kabi Pharmacia for sponsoring the CDTect® kits, and the Lesotho Highlands Development Authority for support and assistance. The administrative assistance of Pam Cerff is also gratefully acknowledged, as are George Sw linger’s comments.

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