

# The awareness of blindness related to misuse of illicit liquor containing methanol: A community study

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**ABSTRACT** Methanol is a cheap organic solvent and additive in the production of illicit liquors. There are many recorded incidences in Indonesia regarding methanol intoxication induced visual loss. We aimed to investigate the level of awareness of liquor-containing methanol misuse in the community related to its hazard of visual loss. Participants were recruited from 3 primary health care units which represent the population of rural communities in Yogyakarta, Indonesia and then divided into two groups: drinkers (cases) and nondrinkers (control). The participants answered closed questions in a questionnaire about knowledges related to the misuse of illicit liquor. Forty participants (mean age:  $39.8 \pm 13.4$ ) completed the questionnaires. There were 40% and 60% of participants who reside in the city and suburbs; their education levels were 2.5%, 12.5%, 30.0%, 35.0%, and 7.5% for uneducated, elementary, junior, senior high school, and undergraduate, respectively. There were 6 drinker and 34 nondrinker participants (sex difference  $p < 0.001$ ). Only 1 drinker and 7 nondrinkers answered correctly the questions regarding the ethanol based liquor. Fifty percent of drinkers and 32.4% of nondrinkers were aware that illicit liquors were most probably mixed with methanol. The drinkers were aware that liquor-containing methanol can cause sudden death (33.3%) or sudden visual loss (33.3%), while 55.8% nondrinker answered only sudden death. Participants' awareness levels regarding the content and the visual outcome of methanol-containing liquor remain low. From this pilot study, we confirmed the need to conduct further research with a larger sample size, followed by clear ethical considerations for blindness prevention.

**KEYWORDS** alcohol poisoning; methanol illicit liquor; vision loss; blindness prevention

## 1. Introduction

Several outbreaks of methyl alcohol poisoning have been reported recently.<sup>1-3</sup> Methyl alcohol is a cheap and used as potent additive in the manufacture of illicit liquors. After ingested, methanol easily crosses all membranes and uniformly distributed to organs and tissues.<sup>4</sup> In ophthalmology, it is closely associated with optic neuropathy, so called toxic optic neuropathy (TON) that produces hypoxia in highly metabolic tissue such as the optic nerves that is associated with retinal edema.<sup>5</sup>

Ingestion of liquor has been implicated in methanol toxicity as early as 1904, with the publication of Wood and Buller's report on 153 cases of blindness caused by methyl alcohol poisoning.<sup>6</sup> A major catastrophe in 1951 documented 323 cases of methanol toxicity after intake of bootleg whiskey containing 35-40% methanol, later published as a comprehensive study by Benton and Calhoun in 1953.<sup>7</sup> The most recent was a case in December 2000 of a Finnish man developing visual

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deterioration resulting in monocular blindness (counting fingers in the left eye) following ingestion of locally produced coconut liquor in Indonesia.<sup>8</sup> An incident where 25 died from methanol poisoning in Indonesia also occurred in 2009.<sup>9</sup>

There are many recorded incidences in Indonesia regarding visual loss induced by methanol intoxication.<sup>10</sup> However, the consumption of methanol is still high and underrecorded.<sup>6</sup> Besides government regulations, the community also has an important role in reducing methanol consumption thus decreasing the number of methanol intoxication induced blindness.<sup>8</sup> One previous study in India showed a low awareness about visual loss in some rural communities followed by low awareness in health services,<sup>11</sup> while there are still under recorded data due to the low level of blindness awareness in Indonesia.

This potentially fatal methanol poisoning may be underlined by low understanding of its hazards moreover regarding blindness. The basic knowledge regarding the hazard of methanol is needed to prevent the incidence of irreversible visual loss or worse. Therefore, we aimed to investigate the level of awareness of liquor-containing methanol misuse in the community related to its hazard of visual loss.

## 2. Methods

This research was a descriptive analytical study. Participants were recruited from 3 randomly assigned primary health care units in the province of Yogyakarta, Indonesia. The participants then answered closed questions in a questionnaire, asking their basic knowledge related to the misuse of liquor-containing methanol. The participants needed to answer a number of questions about the basic characteristics and the hazards of methanol liquor. Then we divided the participants into 2 groups, namely drinkers as case group and the nondrinker group as control, with the drinker group defined as participants who had experiences consuming illicit mixed liquor for more than three months. Nominal variables were inputted and analyzed by proportion test using Fisher exact test with  $p < 0.05$  considered as statistically significant.

## 3. Results

Forty participants (mean age:  $39.8 \pm 13.4$  years old) completed the questionnaires. The basic characteristics (including residence area, and education levels) are shown in Table 1.

We also divided the participants into drinkers and nondrinkers, and analyzed their basic characteristics including the difference of their ocular symptoms (Table 2). Table 2 shows that there were significant differences in sex and ocular complaints ( $p < 0.001$  and  $p = 0.026$ , respectively), revealing that drinkers were all male and had specific ocular symptoms.

Table 3 shows that only 1 drinker and 7 nondrinker answered correctly regarding the ethanol based liquor, revealing that their prior knowledge regarding the content of the liquor was low. There were no significant differences between drinkers and nondrinkers.

Table 4 shows that 33.3% of drinkers were aware that illicit liquors were most probably mixed with methanol, while in the nondrinker group there were only 23.5%. The drinkers were aware that liquor-contained methanol may cause either sudden death (33.3%) or sudden visual loss (16.7%), while 55.9% of nondrinkers answered only sudden death. The knowledge regarding the components of illicit liquor is still low and they were not aware

**Table 1.** Subject characteristics

Characteristics	
Sex, n (%)	
Male	7 (17.5)
Female	33 (82.5)
Age, mean $\pm$ SD	39.8 $\pm$ 13.4
Reside, n (%)	
Urban	16 (40.0)
Suburban	24 (60.0)
Education, n (%)	
Uneducated	6 (15.0)
Elementary school	5 (12.5)
Junior high school	12 (30.0)
Senior high school	14 (35.0)
Undergraduate	3 (7.5)

**Table 2.** The differences between chronic alcohol drinkers and nondrinkers

	Drinker (n=6)	Nondrinker (n=34)	<i>p</i>
Sex, n (%)			
Male	5 (83.3)	3 (8.8)	<0.001
Female	1 (16.7)	31 (91.2)	
Age, mean ± SD	40.3 ± 14.4	39.7 ± 13.4	0.917
Residence, n (%)			
Urban	4 (66.7)	12 (35.3)	0.148
Suburban	2 (33.3)	22 (64.7)	
Education, n (%)			
Uneducated	0 (0.0)	6 (17.6)	0.633
Elementary School	0 (0.0)	5 (14.7)	
Junior High School	3 (50.0)	9 (26.5)	
Senior High School	3 (50.0)	11 (32.4)	
Undergraduate	0 (0.0)	3 (8.8)	
Ocular complains, n (%)			
Blurred vision	2 (33.3)	16 (47.1)	0.026
Ocular pain	1 (16.7)	4 (11.8)	
Dry eyes	0 (0.0)	1 (2.9)	
Total visual field loss	1 (16.7)	0 (0.0)	
Partial visual field loss	2 (33.3)	0 (0.0)	
Combined visual field loss	0 (0.0)	1 (2.9)	
No complain	0 (0.0)	12 (35.3)	

The differences were analyzed using Fisher exact test,  $p < 0.05$  as significant.

**Table 3.** The difference of basic knowledge regarding alcohol and methanol between drinkers and nondrinkers (total answers)

Question	Number of correct answer	Drinker (n=6)	Nondrinker (n=34)	<i>p</i>
Ethanol, n (%)	8 (20.0)	1 (16.7)	7 (20.6)	0.869
Methanol, n (%)	14 (35.0)	3 (50.0)	11 (32.4)	0.583

The differences were analyzed using Fisher exact test;  $p < 0.05$  as significant.

that it may contain methanol. Otherwise, there were no significant differences between drinkers and nondrinkers.

#### 4. Discussion

Our study mainly focused on community awareness about basic knowledge of illicit liquor substance and its side effects. We found that the knowledge regarding the components of illicit liquor is still low and many were not aware that it may contain methanol. We also found that the chronic drinkers had specific ocular symptoms. This result was significant due to our subjects in the drinker group

were obtained from patients with TON. Methanol toxicity is a common problem among individuals of the lower socioeconomic classes in developing countries. Methanol toxicity usually occurs from intentional overdose or accidental ingestion and results in metabolic acidosis, neurologic sequelae, and even death.<sup>12</sup> Specifically, the toxicity is a combined effect of the metabolic acidosis and an intrinsic toxicity of the formate anion.<sup>13</sup>

Methanol poisoning is a medical emergency. It will be a permanent phenomenon in human communities and requires special attention. The severe damage of visual function is devastating to

**Table 4.** The difference of basic knowledge regarding alcohol and methanol between drinkers and nondrinkers (per question item)

Questions	Drinker (n=6)	Nondrinker (n=34)	<i>p</i>
The component of alcohol, n (%)			
Ethanol	1 (16.7)	7 (20.6)	0.948
Methanol	1 (16.7)	9 (26.5)	
Others	2 (33.3)	10 (29.4)	
No Idea	1 (16.7)	4 (11.8)	
The component of Illicit mixed liquor, n (%)			
Ethanol	1 (16.7)	8 (23.5)	0.691
Methanol	2 (33.3)	8 (23.5)	
Others	1 (16.7)	8 (23.5)	
No Idea	2 (33.3)	6 (17.6)	
Adverse effects of methanol mixed liquor, n (%)			
Sudden death	2 (33.3)	19 (55.9)	0.781
Sudden vision loss	1 (16.7)	2 (5.9)	
Internal organ damage	2 (33.3)	8 (23.5)	
Combination	1 (16.7)	4 (11.8)	
Others	0 (0.0)	1 (2.9)	

The differences were analyzed using Fisher exact test;  $p < 0.05$  as significant.

a person's life. This condition could not happen if the misuse of liquor were regulated well by the government, yet now it is still considered as a major problem in Indonesia.<sup>14</sup> There are many factors associated with liquor misuse, but the important one is the socioeconomic factor. Drinkers tend to use illicit liquor to warm their bodies, either to be acknowledged by others, or as an escapement when they have problems.<sup>15</sup> There are two factors associated with liquor misuse such as internal factors from the individual characteristics (genetics, psychological stress, personality disorder, and issues related to religion) and external factors (socioeconomic factors, background, and social control issues, such as peer pressure).<sup>16</sup>

The negative consequences of illicit liquor misuse has driven the need for a multi-component intervention which can be accepted by communities. In Australia, there was a randomized controlled trial study in 20 communities called Alcohol Action in Rural Communities (AARC) project that reported some significant impact.<sup>17</sup> As a result, it was found that the increase of community awareness of blindness related to liquor misuse was related to multicomponent interventions, such as community

engagement and counseling.

From our result, we can conclude that the level of awareness regarding substances and impact of illicit liquor still does not meet expectations. Our data could be used in terms of basic knowledge of awareness in rural areas and could be implemented in paramedical, rehabilitation, and primary health care centers. Our study limitations include: there were inadequate samples for case group and there was no validation in our self-developed questionnaires. We confirmed the need to conduct further interventional community studies such as counseling and evaluating the level of awareness continuously and prospectively.

## 5. Conclusion

Participants' awareness levels regarding the content and the visual outcome of consuming methanol-containing liquor remain low. Knowledge and understanding regarding the hazards are important to prevent the incidence of blindness related to misuse of this illicit liquor. From this pilot study, we recommend conducting further research with larger sample sizes, followed by clear ethical

considerations for blindness prevention.

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There are no conflicts of interest to disclose, this research was made purely for developing better health community.

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