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# Living as a drug addict in Oslo, Norway – a study focusing on nutrition and health

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## Abstract

*Objectives:* To investigate nutritional status and related living conditions among drug addicts in Oslo.

*Design:* A cross-sectional study of nutritional status evaluated by anthropometric and biochemical measurements; a structured interview concerning education, living conditions, income source, drug history and sex practice; and biochemical testing of sexually transmitted infections.

*Setting:* The present study was conducted between November 2001 and April 2003 in locations where the drug addicts reside in Oslo.

*Subjects:* A total of 123 male and seventy-two female addicts using drugs by injections regularly.

*Results:* We found that 20 % of the women were moderately underweight (BMI in kg/m$^2$) (16·5 < BMI < 18·5), 7 % were severely underweight (BMI ≤ 16·5) and 3 % of the men were moderately underweight (16·5 < BMI < 18·5). BMI was positively correlated with days institutionalised and number of eating events per day. Respondents sleeping rough had significantly reduced BMI compared to those in hostels and shelters. The concentrations of Hb, serum ferritin and albumin supported a higher prevalence of malnutrition among the women. Hepatitis C was found in 85 %, active hepatitis B in 6 % and less than 2 % were HIV positive. Also, 84 % received public financial support, 38 % of the women had prostitution as a significant income source, while burglary was most prevalent among the men; 20 % were pushing drugs.

*Conclusion:* Malnutrition among the drug addicts varied from 5 % to 30 %, independent of drug history, education and income. Moderate and severe underweight was most prevalent among the women. Being previously institutionalised and having increased number of eating events increased BMI. Sleeping rough correlated with reduced body weight. Hepatitis C infection was common; hepatitis B and HIV were rare.

**Keywords**
Drug addicts
Nutritional status
Living conditions
Number of eating events
Sexually transmitted infections

Drug addicts, defined as persons abusing drugs by injections[1], live in the periphery of our affluent society, into which they have only limited access. They constantly stay in a stressful situation trying to escape from abstinence, creditors and the police as it is prohibited by the judicial system to use, store, buy and sell such drugs outside public regulation in Norway[2]. Temporarily they migrate to the larger cities to be able to get hold of more and cheaper drugs. It has been reported that 90 % of drug addicts develop a substance-independent mental disorder, mainly symptoms of anxiety[3], which may explain the high prevalence of suicides and overdoses in this population[4].

Searches in ISI Web of Knowledge and Medline databases gave few results on food and nutrition-related living conditions among drug addicts not participating in any treatment or rehabilitation programme. This may be due to lack of interest for this topic in general in the scientific community, in addition to difficulties in carrying out such studies. There have, however, been studies focusing on childhood conditions in the development of drug abuse[5]. The effects of treatment and detoxification programmes have also been studied[6–9].

Both BMI and albumin are among the parameters used in assessing nutritional status, and drug addicts

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undergoing detoxification have shown statistically significant lower BMI and albumin concentrations compared with control groups not using such drugs[10].

Sexually transmitted infections (STI) such as hepatitis B and HIV/AIDS have been associated with illicit drug abuse and negative health effects, including underweight and anaemia[11,12].

The objectives of the present study were to investigate nutritional status and living conditions of drug addicts, including education, source of income, housing and number of meals, in addition to drug history and STI. The addicts were not participating in any drug-related treatment programme when they underwent this assessment.

## Materials and methods

### *Study design*

This is a cross-sectional study of drug addicts who were called upon at locations such as hospices, shelters, meeting places for drug addicts or directly on the streets. The recruitment and examination took place at twenty-three different locations, both at night and at daytime, in the period from November 2001 to April 2003. Immediately after consent, each of the 220 respondents was interviewed before anthropometrical measurements were taken and blood samples were drawn. Difficulties with blood sampling from twenty-five participants resulted in a final number of 195 adult respondents. The participants received snacks such as yoghurt, muffins, chocolate milk and cigarettes after the interviews and testing were completed.

This study was performed according to the Helsinki Declaration[13], and approved by the Norwegian Regional Committee for Medical Ethics. Permission to store personal data on files was obtained from the Norwegian Social Science Data Service. Each participant gave his or her written consent.

### *Subjects*

The 195 respondents were recruited from a population of drug addicts in Oslo, estimated by The Norwegian Institute for Alcohol and Drug Research in 2002 to be between 2750 and 3850 persons, of which 25–30 % were women. Thirty-seven per cent of the subjects in the present study were women. About 16 % of the respondents had their official residency outside Oslo.

All the respondents were adults, that is, older than 18 years of age. Mean age was 36·2 (SD 7·0) years for the 123 men and 34·5 (SD 7·4) years for the 72 women. All reported tobacco smoking.

### *Methods*

A pre-coded questionnaire was used to obtain information about living conditions including number of eating events (meals and snacks) and drug intake during the last 24 h. Four nutritionists carried out the interviews. One physician and three biomedical laboratory scientists took the anthropometric measurements and drew blood samples. Body height (m) and weight (kg) were measured by WHO's standardised methods[14], and were used for calculation of BMI (kg/m$^2$). Moderate underweight was defined as $16{\cdot}5 < \text{BMI} < 18{\cdot}5$ and severe underweight corresponded to $\text{BMI} \leq 16{\cdot}5$ for both genders[14]. Arm muscle circumference (AMC) was attained by procedures described by Symreng[15]. Low values for AMC in the age group 20–39 years were $\text{AMC} \leq 22$ cm for men and $\text{AMC} \leq 18$ cm for women[15]. Blood samples were obtained from all respondents according to standardised methods. Analyses for C-reactive protein (CRP), albumin, Hb, serum ferritin and antibodies against hepatitis B (HBsAg and Anti-HBc), C and HIV virus were carried out at Fürst Medical Laboratories in Oslo according to international accredited methods. Drug detection in blood was carried out at the Norwegian Institute of Public Health, Department of Forensic Toxicology and Drug Abuse.

### *Statistics*

For normally distributed data, parametric tests were performed, and for non-normally distributed data non-parametric tests were used. Student's *t*-test and Mann–Whitney *U*-test analysed differences between groups. Correlation coefficients were analysed by Pearson's test and Spearman's test. Multiple linear regression analyses were used to investigate the impact on BMI by the different living conditions. All multiple regression analyses were adjusted for gender and age in block by entering variable selection options, and they were also thoroughly checked for possible violations from the model assumptions during analyses. $P$ values $\leq 0{\cdot}05$ were considered significant. All statistical analyses were performed by SPSS version 13·00 (SPSS Inc., Chicago, IL, USA).

## Results

To test the validity of the respondents' information about drug abuse, blood samples were analysed with respect to the most used substances in the first twenty-five respondents. With regard to the type of drugs reported to be used in the last 24 h, 98 % were detected. This implies that all respondents were intoxicated (drugged) during the investigation.

The most frequently used drugs by the respondents were heroin and rohypnol, usually in combination with other substances including methadone (Table 1). Mean age for drug debut was 14·4 (SD 4·2) and 16·1 (SD 6·6) years for men and women, respectively, and number of years injecting drugs for the men was 14·9 (SD 9·0) and for the women 14·1 (SD 8·8).

Table 2 shows some socio-economic variables: educational level, sources of income and type of housing. Eight per cent of the men and 12 % of the women had not completed any education. The majority had completed

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**Table 1** Self-reported drug use during the last 24 h among 195 drug addicts in Oslo

| | Men (*n* 123) % | Women (*n* 72) % |
|---|---|---|
| Heroin | 72 | 78 |
| Amphetamine | 32 | 32 |
| Hashish/cannabis | 27 | 14 |
| Rohypnol | 52 | 63 |
| Benzodiazephines | 15 | 22 |
| Methadone + illegal drugs | 8 | 8 |

**Table 2** Educational level, sources of income and type of housing among drug addicts in Oslo (educational distribution for the general population in parentheses)

| | Men | | Women | |
|---|---|---|---|---|
| | *n* | % | *n* | % |
| Educational level | 117 | | 69 | |
| None completed | | 8 (8) | | 12 (9) |
| Primary and lower secondary school | | 64 (20) | | 61 (16) |
| Upper secondary school | | 21 (36) | | 22 (33) |
| College/university | | 7 (36) | | 6 (43) |
| Sources of income | 123 | | 72 | |
| Social security benefits | | 56 | | 57 |
| Disability pension | | 24 | | 24 |
| Rehabilitation benefits | | 7 | | 3 |
| Family/friends | | 8 | | 10 |
| Begging | | 8 | | 3 |
| Break-in/burglary | | 26 | | 11 |
| Prostitution | | 2 | | 38 |
| Pushing drugs | | 23 | | 18 |
| Type of housing last month | 123 | | 71 | |
| Own home | | 21 | | 24 |
| Hospice, lodging, night shelter | | 51 | | 51 |
| Rehabilitation/treatment ward | | 14 | | 22 |
| Acute ward | | 2 | | 4 |
| Friends and family | | 8 | | 21 |
| Sleeping rough | | 8 | | 10 |

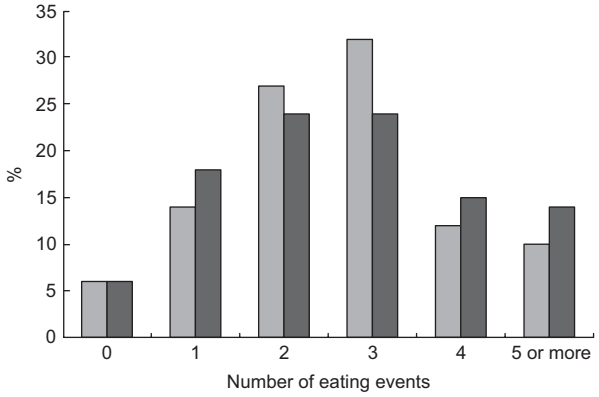


**Fig. 1** Number of eating events during the last 24 h among drug addicts in Oslo: percentage of women (■, *n* 72) and men (□, *n* 123)

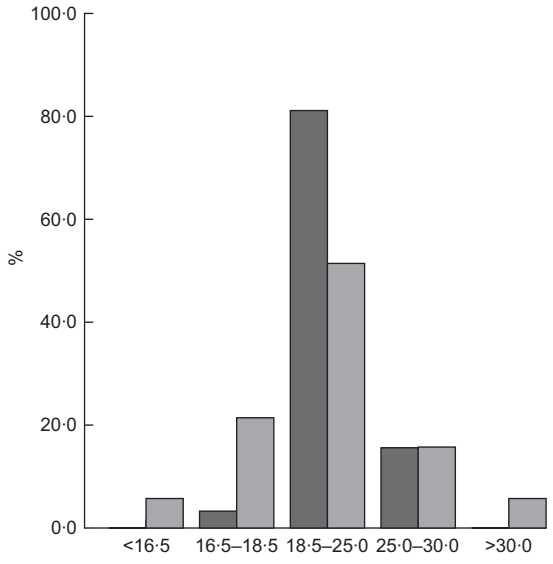


**Fig. 2** BMI (kg/m$^2$) among drug addicts in Oslo: percentage of women (□, *n* 72) and men (■, *n* 123)

lower secondary school, but not upper secondary school or any higher education. The most frequent source of income was social security benefits, followed by disability pension, burglary for men and prostitution for women. Begging, pawning and returning robbed bankcards to the bank were reported as supplementary ways of getting money (not shown).

Forty-six per cent of the men and 41 % of the women respondents had been institutionalised at least 14 days during the last 12 months. Median days institutionalised was 54 for the men and 28 for the women. Approximately 80 % of these had received treatment against drug addiction, 50 % had been imprisoned, 41 % of men and 68 % of women had been hospitalised, whereas 10 % had been patients in psychiatric institutions.

The majority of the respondents were homeless, staying in hospices, lodgings and night shelters, and occasionally they slept rough, i.e. on the street, in parks and parking houses during the last month. More than 20 % of the respondents had a residence at their own disposal. While 8 % of the men reported use of more than one type of lodging the last month, the corresponding figure for the women was 19 % (Table 2). Approximately 40 % never prepared a hot meal, in spite of access to facilities for food storage (>85 %) and cooking (>80 %).

Men had on average 2·6 (SD 1·4) eating events per day, while women had 2·7 (SD 1·6). A meal here means eating and drinking any kind of food including snacks. However, there was a large variation in the meal pattern (Fig. 1). Six per cent had not eaten anything the last 24 h, and this was the same for both genders.

The distribution of BMI (kg/m$^2$) was quite different for women and men (Fig. 2). Seven per cent of the women were severely underweight (BMI ≤ 16·5), 20 % were moderately underweight (16·5 < BMI < 18·5) and only one woman had an AMC measure below 19 cm (low value). Of the men only 3 % were moderately underweight (16·5 < BMI < 18·5) and two men had an AMC measure below 23 cm (low value). On the other hand, 22 % of the

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women and 14% of the men were overweight/obese (BMI > 25).

BMI was positively correlated with age ($P < 0{\cdot}01$), and men had significantly higher BMI than women ($P < 0{\cdot}05$). When adjusted for age and sex, BMI was positively correlated with days institutionalised ($r = 0{\cdot}30$, $P < 0{\cdot}01$) and number of eating events per day ($r = 0{\cdot}26$, $P < 0{\cdot}01$). In the multivariate model, 16% of the variance was explained by these variables (Table 3). Those who slept rough during the previous month had a significantly lower BMI compared with those in hostels and own lodging ($P < 0{\cdot}01$). Drug abuse and drug history did not influence the drug addicts' body weight.

Twenty-five per cent of the male addicts and 63% of the females reported being sexually active with partners. Two per cent of the males and 38% of the females were prostitutes. Among the men 5% used condoms, whereas 33% of the women did. All had access to condoms for free. Six per cent of the male addicts had an acute or chronic hepatitis B infection, 2% were HIV positive. None of the females had hepatitis B or were HIV positive. All had access to injection material for free.

Hepatitis C infection was present in about 85%. Serum albumin concentration was lower for respondents infected with hepatitis C virus for both genders ($P < 0{\cdot}01$). Respondents with methadone abuse had a lower albumin concentration compared with the rest of the respondents ($P < 0{\cdot}05$) (data not shown).

Fifty per cent of the women had CRP values higher than the reference (>10 mg/l), as did 43% of the men. After excluding those with CRP values above the reference value, the values for Hb, serum ferritin and albumin are shown in Table 4. Twelve per cent of the men and 26% of the women had Hb concentrations below the normal range (reference 12·5–16·5 g/100 ml for males and 11·5–15·5 g/100 ml for females). Serum ferritin concentration below the reference value (20–300 μg/l for males and 15–200 μg/l for females) was found in 5% of the men and 19% of the women. Twelve per cent of the men and 30% of the women had albumin values below normal (40–51 g/l).

**Table 3** BMI as a function of age, gender, number of days in institution and number of eating events in 187 drug addicts living in Oslo ($r^2 = 0{\cdot}16$, $P < 0{\cdot}001$)

| Explanatory variables | β | 95% CI | P |
|---|---|---|---|
| Age (years) | 0·086 | 0·03, 0·142 | 0·003 |
| Sex | −0·962 | −1·85, −0·07 | 0·034 |
| Number of days in institution | 0·009 | 0·005, 0·014 | <0·001 |
| Number of eating events | 0·388 | 0·09, 0·69 | 0·012 |

Beta values are unstandardised coefficients.

## Discussion

The present study has posed many different challenges. We experienced difficulties at different administrative levels in the public aid system. We also learned that making appointments with the drug addicts in advance was useless. Therefore, the examination of the respondents had to take place immediately after inclusion. Hence, it was not possible to obtain a representative sample from the population of the drug addicts, and the selection was both opportunistic and strategic. This has to be kept in mind when interpreting the results.

An important issue in this study concerns the reliability of the responses to the questionnaire, since the respondents were under the influence of drugs. We had the

**Table 4** Anthropometric measurements and selected blood parameters in drug addicts in Oslo

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | n | Mean or median | SD or min–max | n | Mean or median | SD or min–max |
| Height (cm) | 122 | 179 | 6·4 | 70 | 167 | 6·5 |
| Weight (kg) | 122 | 71·8 | 10·4 | 70 | 60·5 | 13·1 |
| BMI (kg/m$^2$) | 122 | 22·4 | 2·7 | 70 | 21·7 | 4·4 |
| AMC (cm) | 84 | 27·3 | 2·6 | 46 | 24·7 | 13·9 |
| CRP (mg/l) | 110 | | | 60 | | |
| Mean (SD) | | 16 | 20 | | 24 | 39 |
| Median (min–max) | | 9 | 2–166 | | 11 | 2–217 |
| CRP > 9 mg/l (%) | | 43 | | | 50 | |
| Hb (g/100 ml) | 57 | | | 27 | | |
| Mean (SD) | | 13·6 | 1·2 | | 12·1 | 1·6 |
| Median (min–max) | | 13·5 | 10·3–17·6 | | 12·2 | 7·9–14·9 |
| Hb < normal (%) | | 12 | | | 26 | |
| SF (μg/l) | 57 | | | 27 | | |
| Mean (SD) | | 72·1 | 49·0 | | 34.0 | 22·0 |
| Median (min–max) | | 52 | 13–281 | | 26 | 9–89 |
| SF < normal (%) | | 5 | | | 19 | |
| Albumin (g/l) | 57 | | | 27 | | |
| Mean (SD) | | 43·0 | 5·1 | | 41 | 3·0 |
| Median (min–max) | | 44 | 14–49 | | 41 | 35–47 |
| Albumin < normal (%) | | 12 | | | 30 | |

AMC, arm-muscle circumference; CRP, C-reactive protein; SF, serum ferritin.

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opportunity to check their ability to remember what kinds of substances they had used the last 24 h, since we also conducted blood analyses of the drugs. There was a match of 98 % between their responses and the blood analyses. Thus, there is no reason to doubt the reliability of this information. Drug abuse reported earlier among Norwegian addicts, where 20 % were younger than 18 years of age, corresponded with our results concerning the use of heroin and benzodiazephines[16]. However, the use of cannabis and amphetamine was more prevalent among those younger than 18 years of age. The drug intake among our respondents was much like the abuse pattern for the rest of the addict population older than 18 years[16].

The type of drugs used did not seem to have an influence on the drug addicts' body weight in the present study. Other studies have revealed an association between low BMI and 'speed' (cocaine and amphetamine), either alone or mixed with narcotics (opiates, for instance heroin), but not for opiates alone[17]. Our respondents mostly mixed different kinds of drugs, which probably masked the weight-changing effects. On the other hand, it is likely that the drugs affected Hb concentrations, of which 12–26 % were under the reference value. Other studies have revealed such a connection[18], showing that use of heroin in itself is associated with lowered iron status. In the present study we found no impact of drug history (age of drug debut and number of years of drug abuse) on the nutritional status. The respondents' nutritional status measured by BMI improved with age, probably due to experience in how to survive as a drug addict.

BMI was on average lower among our respondents than in the general population[19]. Thirty per cent of the male addicts and 39 % of the women had a BMI below 80 % of the mean values for the general population of the same age group[19]. A study from Spain indicated that approximately 30 % of drug addicts under treatment or detoxification weighed less than 80 % of the mean weight for the general population[20]. Thus it is likely to be presumed that drug addiction in itself implies weight loss.

Underweight was nine times more frequent among our female respondents than the males. These gender differences could be due to bias in the recruitment, since this study could not be randomised. However, it is likely that the higher percentage of underweight among the women is due to the fact that more men had been institutionalised for longer periods (median days 54 for men and 28 for women). Being institutionalised during the last 12 months, including being in prison, had a significant positive influence on BMI. Another study, which focused on weight changes during recovery from drug abuse, verifies similar weight gain[21]. Without these institutional brakes, the drug addicts would probably have been even more undernourished.

The blood analysis of nutrient parameters supported the findings from the anthropometric measurements concerning a higher prevalence of malnutrition among female than male drug addicts. This coherence strengthens the validity of the data. Concentrations below reference values were twice as frequent among the females concerning Hb, four times regarding serum ferritin and more than double for albumin.

Korolenko *et al.*[22] found reduced albumin concentrations in all groups of drug addicts with drug addictive disorders (caused by crude home-made opiates) as a result of modified acute-phase reactions. We found increased CRP values among 43 % of the male addicts and 50 % of the women. Wilczek *et al.*[18] found a frequency of increased CRP values among 25 % of opiate abusers. The elevated CRP concentrations in our study may be caused by hepatitis, crude opiates and other factors associated with lack of sufficient hygiene of injections.

Even though most of the respondents had access to facilities for food storage and cooking, many of them (40 %) never prepared hot meals. On average, they had half the number of eating events (meals and snacks) a day (2·7 for women and 2·6 for men) compared with the results from a nationwide study (corresponding to 5·5 and 5·4 meals)[23]. Only 10 % of the drug addicts had five or more eating events a day. The low number of eating events was important for their nutritional status, as shown in the multivariate analysis. Sleeping rough contributed to a deteriorated nutritional status and may be both a reason for and a consequence of sickness and exhaustion, due to lack of food and other basic needs, such as warming clothes and a proper place to sleep. Freezing and lack of sleep may contribute to drop in body weight. This assumption is supported by studies of homeless alcohol addicts in Paris[24]. No other connections between housing and nutritional status were seen, probably due to the generally poor housing.

Educational level was remarkably lower among the drug addicts than in the general population[25]. Completion rates at primary and secondary levels were almost the same for both genders. Concerning graduation from college or university, the gap between the general population and drug addicts was larger for the women (6 % compared with 43 %), even though there was a considerable gap also for the men (7 % compared with 36 %). No influence between educational level and nutritional status was seen, probably due to a small variation in educational level in the sample of this study.

Source of income was predominantly public financial support, which amounts to about 20 % of an average Norwegian income[26]. There was no difference between the genders, in contrast to the general population, where women more often received such financial support[26]. Most of the addicts had several additional sources of income. We found no correlation between receiving public financial support and nutritional status in the present study, which indicates that the respondents obtained significant amounts of money from other sources, and/or got hold of food in other ways than purchasing with money.

Even though the present study has pointed out substantial malnutrition and other health-related hazards, these states may have been underestimated due to methodological and practical difficulties during sampling and data collection. However, the findings may reflect that the drug addicts who participated were still up and about, and not subject to any treatment. This may imply that their reduced nutritional status and failing health not yet had touched rock bottom.

## Conclusion

The drug addicts in the present study lived stressful lives, and were afflicted with health hazards such as malnutrition and chronic infections. This exposure was independent of drug history, education and income. Hepatitis C infection was common; hepatitis B and HIV were rare. Being previously institutionalised and having increased number of eating events increased BMI. Generally the housing was poor, and sleeping rough influenced nutritional status negatively.

The lives of the drug addicts probably resemble a roller coaster, switching from hectic periods of drug abuse at street level to calmer phases of treatment, rehabilitation and imprisonment, implying regular meals. This may cause rapid variations in nutritional status. In our study we met the addicts outside institutions, on varying levels on their way down the big dipper. Further studies that intend to investigate what drug addicts' changing nutritional status really implies should take into account this switchback effect, as a challenge towards a more precise estimation of the nutritional status among drug addicts.

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*Author contributions:* M.S. is the researcher and has carried out all parts of the project. M.H. has contributed to the writing of the manuscript and performed all statistical calculations. F.-L.E. has been responsible for the medical examinations and the design of the protocol. A.S. has participated in the design of the protocol and in the field work. M.W. has participated in the writing of the manuscript. T.B. has participated in the design of the protocol and writing of the manuscript. A.O. is the principal investigator and has taken part in the design and writing of the manuscript.

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