Original Article

An Exploratory Study of Units of Reporting Opium Use in Iran: Implications for Epidemiologic Studies

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Abstract
Background: Measuring the amount of opium use is a challenge in epidemiologic studies. Self-report of amount of opium use at each consumption, widely used in the literature, usually fails to provide a good estimate. The purpose of this study is to systematically study the perceived weight units of reported opium use in Iran, and compare them to the standardized units of weight measurement.
Methods: An exploratory descriptive study was conducted in six major cities of Iran. Study participants were interviewed and asked to use a Play-Doh-like material to demonstrate the amount of opium they use. To obtain an estimate of the weight of the material used, we multiplied the volume by the density of the opium product. We experimentally determined the density of the commonly used opium products. We used medians and inter-quartile ranges (IQRs) to report the typical amount of each unit.
Results: A total of 108 individuals participated in this study. The most frequently reported unit was "*gram*"; the median perceived weight for one gram (g) of opium was 0.24 (IQR: 0.16) g. The second most commonly used unit was *nokhod* with a median of 0.16 (IQR: 0.16) g, followed by *mesghaal* and *hab/habeh*, which were 1.28 (IQR: 0.81) and 0.16 (IQR: 0.16) g, respectively. The median perceived weight of *mesghaal* and gram in the studied cities was less than the expected standardized values.
Conclusion: In conclusion, the reported amount of opium use is highly inaccurate and unreliable, and is mainly subject to underestimation.
Keywords: Environmental Exposures, Epidemiology, Iran, Opium, Substance-related disorders
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Introduction

The prevalence of illicit opium use is high in Iran,[1] particularly in certain parts of the country such as Kerman province.[2] Smoking and oral ingestion of opium have both been associated with a higher risk of several diseases, including cardiovascular diseases,[3] cancers of the larynx, bladder, esophagus, stomach, and lung; and chronic obstructive pulmonary diseases.[4-9] Indeed, in some studies, opium had a stronger association with cardiovascular disease and several cancers than tobacco smoking did.[3] These epidemiologic findings are supported by chemical and cell culture studies showing that pyrolyzed derivatives of opium have significant mutagenic activity.[10-14]

Notwithstanding the above results, epidemiologic studies face some difficulties in accurately measuring the amount of opium used. In particular, opium users are usually not able to provide a good estimate of the amount of opium used at each consumption. While opium use is

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relatively common, it is an illicit substance; therefore, there is no standard in packaging opium or units of weight used. Various units are used and reported by drug dealers and users, which include "*nokhod*", "*mesghaal*", "*bast*", "*soot*", "*hab/habeh*", "*adas*", and "*gram*". Some of these units (e.g. *hab/habeh* or *adas*) are not standardized units. Moreover, it is not even known if a "*gram*" of opium reported by users is close to the international metric gram (g). Opium users, as well as dealers might have low or no formal education and may have a different understanding of the unit. Furthermore, the amount used each time is usually small, typically less than a gram, which adds to lower reliability in the reported amount. Previous epidemiologic studies have usually used *nokhod* for weight of opium,[2,9,15-18] a unit roughly close to 0.2 g, but no study has verified that the actual weight of 0.2 g is perceived and reported by the users. Therefore, while researchers may have a reasonable estimate of the duration of use, estimates for the average amount of use per day and cumulative amount of use (in terms of *nokhod*-years) may be questionable.

The purpose of this study is to systematically study the units of perceived and reported opium use in Iran, and compare them to standardized units – a step necessary to obtain more accurate estimate measures of use and hence, more accurate risk ratios for long-term use of opium in relation to chronic diseases.

Materials and Methods
Study Setting and Participants
An exploratory descriptive study was performed from February 2018 to June 2018 in six major cities of Iran, including Tehran (capital city, northcentral), Kerman (southeast), Mashhad (northeast), Kermanshah (west), Tabriz (northwest), and Gonbad (northeast).

Participants were recruited from either methadone maintenance treatment clinics or from hospital wards located in each city. Study participants had to be over 20 years of age and had to have used opium at least ten times in the year prior to the study. Based on the available literature, we planned to recruit approximately 100 participants (15–20 from each center) to obtain a reasonable estimate of the units used, the median and inter-quartile range (IQR) of the unit, and saturation of interviews. Interviewers were clinical psychologists or general physicians and were trained intensively.

Interviews and Measurements
Study participants were asked to participate in a short interview with voice recording, complete a questionnaire, and using a Play-Doh-like material, demonstrate the amount of opium they use. All interviews were conducted in private rooms. Before enrollment, trained research staff explained the aim of the study and obtained verbal informed consent. The participants were informed about their voice being recorded, and if they disagreed,

the interview proceeded without voice recording. The interviewers administered a structured questionnaire which had two parts: (1) demographic characteristics; and (2) the amount of opium used each time.

Demonstration Units
Users cut opium, which has a dough-like texture, into amorphous pieces. Therefore, it is difficult to report exactly how much they use each time. A challenging part of the study was to find a good tool which the study participants could use as a unit to show their opium use. We considered beans, pottery dough, and Play-Doh-like material, and chose the latter. The Play-Doh used for this study was Arya 1068 Play Dough, Naghsh-e-Tandis Company, Tehran, Iran, which was available in all study centers. This material is very similar to opium in texture and also density. The interviewers asked the study participants to cut the dough into the size they use at each consumption (e.g., two *nokhods*). To obtain an accurate estimate of density, we used samples of opium and its derivatives, officially obtained from the Iranian Anti-Narcotics Police. We experimentally determined the density of the commonly used opium products, such as crude opium (also known as *teriak*, approximately 0.32 g/mL), opium juice (*shireh*, 0.33 g/mL), and pyrolyzed opium (*sukhteh*, 0.31 g/mL).

Statistical Analysis
To obtain the mass of opium used each time, we multiplied the volume of use, as shown by the study participants using Play-Doh particles, by the density of the opium product. Because of the highly skewed distribution of the amounts used, we used medians and IQRs to report the weight for each utilized unit. All analyses were performed using STATA (version 14; Stata Corp, College Station, TX, USA).

Results
A total of 108 individuals participated in this study, the majority of whom (95.3%) were men. The age range of the participants was 23 to 77 years, with a mean (standard deviation) of 42.3 (11.6) years. The mean (SD) initial age of opium use was 26.3 (±10.2). The main route of opium use was smoking (69.2%), followed by oral ingestion (22.8%), a combination of smoking and oral ingestion (7.2%), and rarely, intravenous injection use (0.8%).

Table 1 shows the frequency of utilized units for opium weight by the opium users. The most frequently reported unit was "*gram*", which was not the same as the standard gram. In fact, there was substantial variation, ranging from 0.03 to 1.36 g, with a median (IQR) of 0.24 (0.16) g. The mass corresponding to *nokhod*, the second most commonly used unit, weighed from 0.05 to 1.44 g, with a median (IQR) of 0.16 (0.16) g. Other units and their corresponding masses are shown in Table 1.

Table 1. Frequency of Reported Units of Opium and Their Corresponding Estimated Mass in Grams

Unit Name	Frequency of Report	25% Percentile(g)	Median (g)	75% Percentile(g)	5% Trimmed Mean (g)	IQR(g)	Min(g)	Max(g)	Expected Standard[a] (g)
Gram	83	0.16	0.24	0.25	0.26	0.16	0.03	1.36	1.00
Nokhod	43	0.08	0.16	0.24	0.19	0.16	0.05	1.44	0.20
Mesghaal	33	0.81	1.28	1.62	1.36	0.81	0.19	3.22	4.58
Hab/Habeh	26	0.16	0.16	0.32	0.22	0.16	0.08	0.96	0.20
Bast	19	0.08	0.16	0.32	0.21	0.24	0.04	0.64	0.1
Adas	8	0.06	0.08	0.08	0.08	0.02	0.04	0.16	0.048
Soot	2	0.03	0.17	0.32	0.17	0.28	0.03	0.32	0.001

IQR, interquartile range; min, minimum; max, maximum
[a] Expected standard was obtained from Persian dictionaries.

Table 1 also compares the mass described by the users (volume used times density) compared to either the international metric unit of gram or the definition of these units found in two major Persian dictionaries, i.e. Dehkhoda and Amid. As shown in the table, except for "*soot*" and "*adas*", the other reported units were substantially lower than those found in dictionaries. There was a substantial variation in the estimated mass of opium across studied cities. As shown in Figure 1 (and Supplementary file 1, Tables S1-S6), the median value for *mesghaal* and *gram* was considerably underreported in all studied cities compared to the expected standard values, while the median estimations for *nokhod* and *hab/habeh* differed considerably in the cities.

Discussion

The results of this study suggest that the amount of opium use reported by the Iranian population is highly unreliable. There are no standardized units of use, and the units used

by the people range widely, sometimes by the region. There was a tendency to under-report the amount used.

There are several reasons why the reported amounts are unreliable, which might include lack of packaging, poor literacy of users, using multiple unstandardized units, and the small amounts of use that make measurements difficult. Opium is not packaged in a standard form, so it is impossible to report based on packaging. Many of the opium users are old and have poor literacy, and therefore have no good sense of gram or other standardized units. Other justifications for this finding are visual-spatial errors or bragging. Sometimes users find large amounts of use as a sign of strength and masculinity, and may brag about their amount of use when they report. Another reason may be that drug dealers are untruthful about the amount they are selling to their clients.

There is a multitude of units that have been developed over millennia. In fact, there is historical evidence of the weight systems used in Iran as far back as the Achaemenid
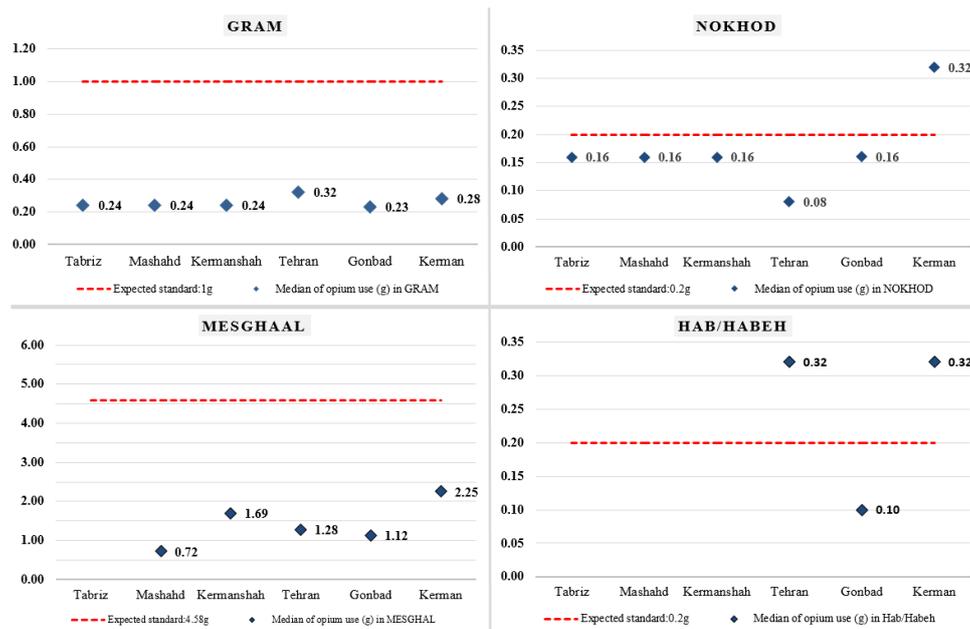
Figure 1. Dot Plot of the Most Prevalent Units by City. Red dash-lines are the expected standard value of the units. Blue rhombi are the median reported value of the unit by studied city. *Note:* for zero report value of the unit, no value was mentioned on the chart.

dynasty (550-350 BCE)-the first Persian Empire. However, opium production and use peaked in Iran (Persia) in the 19th century, and units commonly used then, such as *nokhod* and *mesghaal* are still used to measure opium.[19] However, these units are not entirely standardized and may vary from city to city.

Iran has the highest amount of opiates like opium (*teriak*) in the world,[20] and as such, many epidemiologic investigations have studied the association of opium use to a variety of chronic diseases. Several of these studies have examined dose-response associations.[2,4,9,16,17] These studies have typically used "*nokhod*" as the primary unit of use, and in several, there was an assumption that a *nokhod* was equivalent to 0.2 g. We found that the median for this unit was 0.16 g, but there was substantial variability. In addition, we found that the most common unit of use was "*gram*", not *nokhod*. However, the median "*gram*" reported by opium users was close to 0.2 g, not one metric gram. Therefore, the cumulative use reported by many study participants might have been inaccurate, leading to misclassification.

It is critically important to measure opium accurately in epidemiologic studies. Millions of individuals use opium and its products illicitly, and opium use has been linked to a substantial increase in mortality due to cardiovascular diseases and cancer. Given the inaccuracy of reported results, which is clearly shown in this study, we suggest developing a three-dimensional album for the volume of use. The three-dimensional album could reflect the 5th to 95th percentiles of typical use in Iran, with regular increments that are visibly different to the naked eye and can be easily used in epidemiologic studies. The use of this album can be validated by showing it to known heavy users and light users, and by comparing with concentrations of urine metabolites of opium.

Our study has several strengths. It is the first study of its kind. The study was conducted in several geographic locations across Iran, innovatively used a Play-Doh-like material, and was not subject to recall errors. This study has some limitations, too. Like other semi-qualitative studies, our study was potentially prone to interviewer bias arising from data collection in methadone maintenance treatment clinics and the sensitivity of the topic. Nevertheless, we did our best to reduce the bias by providing clear instructions, appropriate training, and close supervision and monitoring of data collection. Another potential limitation is the modest number of opium users in the study. The current study was not a survey and the result should be cautiously interpreted; hence, future studies should focus on recruiting larger samples, increasing diversity and using multiple sites to recruit participants (regular opium users) to show the more accurate geographical variation in reporting the units of opium use. Besides, a three-dimensional album should be considered as one of the assessment tools for measuring the amount of opium use. The strict regulation banning access to various opium samples in each geographic area may also be an issue, since density of opium and its derivatives may vary by region.

In conclusion, this descriptive study showed that the reported opium use is highly inaccurate and unreliable, and mostly subject to errors in estimation and underestimation of the used opium amount. We suggest developing a three-dimensional album and testing it for measurement of opium in epidemiologic studies.

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