

Adverse events and poisoning from over-the-counter traditional Chinese medicine: a population-based survey

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KEY MESSAGES

1. Adverse events related to over-the-counter (OTC) traditional Chinese medicine (TCM) use are much more prevalent in Hong Kong than previously suggested from hospital-based data.
2. Widespread misperceptions among users, and the use of unreliable OTC TCM information sources (such as magazines) present major challenges for safe OTC TCM use.
3. In addition to greater consumer education, OTC drug safety can be improved with more stringent labelling regulations, up-to-date OTC

TCM product safety websites for consumers and health professionals, and improved surveillance of adverse events in an outpatient setting.

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Introduction

In Hong Kong, self-medication with traditional Chinese medicine (TCM) is a common practice for conditions ranging from the common cold to chronic health conditions.¹ Approximately one-seventh of Chinese herbal medicine poisoning cases reported from accident and emergency departments have been attributed to over-the-counter (OTC) TCM products.² The majority of TCM users were reported to have self-prescribed OTC products without prior consultation of a TCM practitioner.³ There is concern about the potential misuse of these products, particularly given that most OTC TCM users are of lower educational status.³

As of January 2012, only 188 (1.8%) of the 10 518 OTC TCM products available in Hong Kong have completed formal registration required for proprietary TCM products; the remaining are in the process of transitional registration.⁴ This study aimed to examine knowledge, attitude, and behaviour of OTC TCM users in Hong Kong and their association with adverse events.

Methods

This study was conducted from January 2011 to January 2012. Ethical approval was obtained from the Survey and Behavioural Research Ethics Committee of The Chinese University of Hong Kong. A population-based telephone survey targeting Chinese residents of Hong Kong aged over 18 years was conducted. For unanswered calls, at least four further calls were made before considering the number to be invalid. If more than one eligible

person were available, the 'last birthday method' was used to select the participant. The study sampled 1100 respondents (response rate, 70.1%).

Respondents were asked about their background (age, gender, household income level, educational attainment, marital status, employment status, self-reported general health, and presence of health insurance), the conditions for which they used OTC TCM (whether the condition was self-diagnosed or by a medical professional, whether the product labels had clear information about dosage and contraindications), and any adverse events in the past year (rash, nausea, vomiting, fever, dizziness, heart/blood pressure problems, systemic allergic reactions, sleep problems, and all others). Those who experienced adverse events were asked about the type of OTC TCM used, source of product use information, and where they sought professional medical help for the adverse event.

In addition, their beliefs and knowledge about the safety, effectiveness, potential harms, potential drug interactions, and potential benefits of the OTC TCM were recorded, as were their perception of current OTC TCM labels, their beliefs about the likelihood of side effects, drug interactions and adverse events after OTC use and the perceived severity of these effects. Respondents were questioned about what they perceived as the main barriers to better-informed OTC TCM use (financial barriers, lack of convenient access to TCM practitioners, lack of published information on the internet, unclear written instructions, lack of information at the retail establishments, lack of knowledge among western doctors and pharmacists), and whether they had

ever received any warnings about OTC TCM drug safety and how confident they were of being able to find reliable OTC TCM information.

Chi-square test and t-test were used to assess associations between predictors (eg demographic variables) and outcome variables (ie adverse events, knowledge levels, information-seeking behaviours). Variables with a P value <0.15 in the unadjusted analyses were used as candidate variables for stepwise multivariable logistic regression models to examine whether the respondent experienced an adverse drug reaction and whether the respondent sought OTC information from reliable sources (package labels, health professionals, and TCM retailers).

Results

Of the 1100 respondents, 789 (71.7%) reported past-year OTC TCM use. The most common conditions for which OTC TCM was used were cold/flu symptoms (54.0%), gastrointestinal/digestive problems (44.0%), musculoskeletal pain (43.9%), 'qi' imbalance (23.7%), general health enhancement (13.7%), and sleep problems (5.3%) [Table 1]. OTC

TCM users were comparable with non-users except that the former were more likely to be of middle income (15 000-29 999/month) and less likely to report 'very good' or 'good' health status. Of the entire sample, 2.3% (3.2% of users, n=25) reported at least one past-year adverse event. Only 56.8% of respondents reported exposure to warnings about safe OTC TCM use from any source.

Comparing OTC TCM users who did or did not report an adverse event in the past year, the former surprisingly reported greater information-seeking practice and were more likely to be exposed to drug safety warnings (Table 1). The multivariable logistic regression analysis revealed that occurrence of a past-year adverse event was associated with lower educational attainment (P=0.01) and seeking OTC information from unreliable sources such as television (P<0.05), popular magazines (P<0.05), or books (P<0.10). Respondents who were less educated, male, and those with less self-efficacy in obtaining reliable OTC information were less likely to seek OTC use information from the package, TCM retailers, or health professionals (Table 2).

TABLE 1. Comparison of over-the-counter (OTC) traditional Chinese medicine (TCM) users who did or did not report adverse events

| Parameter | Mean±SD or % of users | | | P value |
|-------------------------------------|-----------------------|-----------------------|---------------------------|---------|
| | All users (n=789) | Adverse events (n=25) | No adverse events (n=764) | |
| Read OTC Labels | | | | 0.005 |
| Always | 48.3 | 84.0 | 47.1 | |
| Often | 18.5 | 0.0 | 19.1 | |
| Sometimes | 16.5 | 4.0 | 16.9 | |
| Seldom | 7.5 | 8.0 | 7.5 | |
| Never | 9.3 | 4.0 | 9.4 | |
| Read OTC package inserts | | | | 0.031 |
| Always | 35.4 | 64.0 | 34.4 | |
| Often | 20.5 | 20.0 | 20.5 | |
| Sometimes | 20.7 | 8.0 | 21.1 | |
| Seldom | 11.3 | 4.0 | 11.5 | |
| Never | 12.2 | 4.0 | 12.4 | |
| Asks OTC information from retailers | | | | 0.410 |
| Always | 3.8 | 4.0 | 3.8 | |
| Often | 9.4 | 12.0 | 9.3 | |
| Sometimes | 19.9 | 28.0 | 19.6 | |
| Seldom | 15.8 | 24.0 | 15.6 | |
| Never | 51.1 | 32.0 | 51.7 | |
| Search online OTC information | | | | 0.342 |
| Always | 1.0 | 4.0 | 0.9 | |
| Often | 2.9 | 0.0 | 3.0 | |
| Sometimes | 7.1 | 12.0 | 6.9 | |
| Seldom | 8.5 | 12.0 | 8.4 | |
| Never | 80.5 | 72.0 | 80.8 | |

TABLE I. (cont'd)

| Parameter | Mean±SD or % of users | | | P value |
|--|-----------------------|-----------------------|---------------------------|---------|
| | All users (n=789) | Adverse events (n=25) | No adverse events (n=764) | |
| Ask medical doctors or pharmacists about OTC use | | | | 0.030 |
| Always | 0.4 | 4.0 | 0.3 | |
| Often | 2.9 | 4.0 | 2.9 | |
| Sometimes | 3.9 | 8.0 | 3.8 | |
| Seldom | 8.5 | 4.0 | 8.7 | |
| Never | 84.2 | 80.0 | 84.4 | |
| Tell their medical doctors of TCM use | | | | 0.285 |
| Always | 20.9 | 32.0 | 20.6 | |
| Often | 12.3 | 20.0 | 12.1 | |
| Sometimes | 11.2 | 8.0 | 11.3 | |
| Seldom | 9.4 | 12.0 | 9.3 | |
| Never | 46.2 | 28.0 | 46.8 | |
| Ask TCM practitioner about OTC? | | | | 0.186 |
| Always | 2.9 | 0.0 | 3.0 | |
| Often | 5.2 | 12.0 | 5.0 | |
| Sometimes | 14.4 | 16.0 | 14.3 | |
| Seldom | 7.6 | 16.0 | 7.3 | |
| Never | 69.9 | 56.0 | 70.3 | |
| Practice score (max=28) | 9.22±5.00 | 9.12±5.0 | 12.20±5.8 | 0.002 |
| OTC knowledge score (max=6) | 3.52±1.45 | 3.64±1.60 | 3.52±1.45 | 0.712 |
| Perceived benefits score (max=12) | 6.67±2.99 | 6.76±2.40 | 6.67±3.01 | 0.851 |
| Perceived OTC adverse event severity (max=6) | 4.71±1.25 | 4.48±1.61 | 4.72±1.24 | 0.467 |
| Perceived adverse event susceptibility (max=8) | 3.50±1.97 | 3.46±1.95 | 3.50±1.95 | 0.937 |
| Perceived OTC info barriers (max=12) | 7.23±2.21 | 7.36±2.31 | 7.24±2.20 | 0.801 |
| Usual source(s) of OTC information | | | | |
| TV | 8.1 | 24.0 | 7.6 | 0.003 |
| Retailers | 22.8 | 40.0 | 22.2 | 0.037 |
| Internet | 5.6 | 4.0 | 5.7 | 0.724 |
| Newspapers | 7.6 | 16.0 | 7.4 | 0.109 |
| Health professionals | 11.6 | 8.0 | 11.7 | 0.570 |
| Friends and family | 43.4 | 52.0 | 43.1 | 0.377 |
| Magazines | 5.3 | 20.0 | 4.9 | 0.001 |
| Drug labels/inserts | 56.7 | 66.7 | 56.4 | 0.387 |
| Other sources (books) | 7.6 | 16.0 | 7.1 | 0.092 |
| Conditions for past year OTC use | | | | |
| Cold/flu | 54.0 | 64.0 | 53.7 | 0.308 |
| Gastrointestinal/digestive problems | 44.0 | 44.0 | 44.0 | 0.971 |
| Musculoskeletal pain | 43.9 | 76.0 | 42.7 | 0.001 |
| 'Qi' imbalance | 23.7 | 32.0 | 23.4 | 0.321 |
| General health enhancement | 13.7 | 20.0 | 13.5 | 0.351 |
| Sleep problems | 5.3 | 20.0 | 4.8 | 0.001 |
| Skin and hair problems | 4.3 | 8.0 | 4.1 | 0.333 |
| Treating open wounds | 4.1 | 8.0 | 3.8 | 0.287 |
| Chronic respiratory problems | 3.5 | 0.0 | 3.5 | 0.339 |
| Slimming/weight loss | 1.1 | 8.0 | 0.9 | 0.001 |
| Blood pressure/heart conditions | 0.5 | 4.0 | 0.4 | 0.012 |
| Improving mental functioning/memory | 0.3 | 8.0 | 0.0 | <0.0001 |
| Sexual health/reproductive conditions | 0.4 | 0.0 | 0.4 | 0.754 |
| Vision problems | 0.3 | 0.0 | 0.3 | 0.798 |
| All other conditions | 1.8 | 4.0 | 1.7 | 0.392 |

TABLE 2. Correlates of adverse events and seeking reliable information (including package labels and inserts, health professionals, and retailers) in over-the-counter (OTC) traditional Chinese medicine (TCM) users (n=789)

| Parameter | % with adverse events | P value | OR (95% CI) | | % seeking reliable OTC information | P value | OR (95% CI) | |
|---|-----------------------|---------|--------------------------|-------------------|------------------------------------|---------|--------------------------|-------------------|
| | | | Sociodemographic factors | All factors | | | Sociodemographic factors | All factors |
| Total OTC TCM users | 3.2 | | | | | | | - |
| Gender | | 0.146 | | | | 0.076 | | |
| Male | 2.2 | | Not significant | - | 66.6 | | 1.00 | 1.00 |
| Female | 4.0 | | | | 72.4 | | 1.38 (1.01-1.87)* | 1.53 (1.07-2.20)* |
| Age (years) | | 0.043 | | | | 0.816 | | |
| 18-44 | 1.9 | | Not significant | - | 69.3 | | - | - |
| 45+ | 4.4 | | | | 70.1 | | | |
| Educational level | | 0.002 | | | | 0.010 | | |
| F6 and higher | 0.7 | | 1.00 | 1.00 | 75.0 | | 1.00 | 1.00 |
| Up to F5 (grade 11) | 4.8 | | 7.43 (1.74-31.8)† | 9.64 (2.20-42.3)† | 66.3 | | 0.64 (0.46-0.88)† | 0.64 (0.44-0.94)* |
| Household income (HK\$/month) | | 0.291 | | | | 0.794 | | |
| ≥15 000 | 4.3 | | - | - | 71.2 | | - | - |
| 0-14 999 | 2.7 | | | | 70.3 | | | |
| Health Insurance | | 0.100 | | | | 0.740 | | |
| Insured | 4.3 | | Not significant | - | 70.3 | | - | - |
| Uninsured | 2.2 | | | | 69.3 | | | |
| Employment | | 0.008 | | | | 0.263 | | |
| Employed or full-time student | 1.8 | | Not significant | - | 71.3 | | - | - |
| All else | 5.1 | | | | 67.6 | | | |
| OTC knowledge level | | 0.307 | | | | 0.003 | | |
| High knowledge score (>IQR) | 6.0 | | | - | 82.1 | | | Not significant |
| Score in IQR | 2.9 | | | | 69.6 | | | |
| Low knowledge score (<IQR) | 2.9 | | | | 58.6 | | | |
| Perceived benefit | | 0.141 | | | | 0.628 | | |
| High benefit score (>IQR) | 2.2 | | | | 69.3 | | | - |
| Score in IQR | 4.2 | | | | 71.0 | | | |
| Low benefit score (<IQR) | 0.9 | | | | 65.1 | | | |
| Perceived barrier | | 0.472 | | | | 0.835 | | |
| Low barrier score (<IQR) | 3.2 | | | - | 69.9 | | | - |
| Score in IQR | 2.8 | | | | 69.3 | | | |
| High barrier score (>IQR) | 4.9 | | | | 70.9 | | | |
| Perceived severity of OTC adverse event | | 0.101 | | Not significant | | 0.249 | | |
| High severity score (>IQR) | 2.7 | | | | 100.0 | | | - |
| Score in IQR | 4.3 | | | | 70.3 | | | |
| Low severity score (<IQR) | 7.7 | | | | 65.4 | | | |
| Perceived susceptibility to OTC adverse event | | 0.674 | | | | 0.338 | | |
| High susceptibility score (>IQR) | 2.9 | | | - | 68.4 | | | - |
| Score in IQR | 2.6 | | | | 69.2 | | | |
| Low susceptibility score (<IQR) | 4.1 | | | | 75.3 | | | |

* P<0.05

† P<0.01

‡ Comparison with those not reporting those behaviours

TABLE 2. (cont'd)

| Parameter | % with adverse events | P value | OR (95% CI) | | % seeking reliable OTC information | P value | OR (95% CI) | |
|---|-----------------------|---------|--------------------------|-------------------|------------------------------------|---------|--------------------------|-------------------|
| | | | Sociodemographic factors | All factors | | | Sociodemographic factors | All factors |
| Preventive practice | | 0.008 | | | | | | |
| High practice score (>IQR) | 6.0 | | | 1.00 | - | | | - |
| Score in IQR | 2.4 | | | 0.40 (0.17-0.96)* | | | | |
| Low practice score (<IQR) | 1.0 | | | 0.16 (0.03-0.72)* | | | | |
| Exposed to any TCM warnings | | 0.650 | | | | 0.002 | | Not significant |
| Yes | 2.9 | | | - | 73.8 | | | |
| No/can't recall | 3.5 | | | | 63.2 | | | |
| Self-efficacy for obtaining reliable OTC information? | | 0.123 | | | | <0.001 | | |
| Yes, have self-efficacy | 2.4 | | | Not significant | 78.1 | | | 1.00 |
| No/not sure | 4.4 | | | | 58.2 | | | 0.52 (0.36-0.76)† |
| Usual source of OTC information | | | | | | | | |
| Package labels | 3.1 | 0.387‡ | | - | 80.9 | <0.001 | | |
| Retailers | 5.6 | 0.037‡ | | Not significant | 83.7 | <0.001 | | |
| Health professionals | 2.2 | 0.570‡ | | - | 74.7 | 0.268 | | |
| Internet | 2.3 | 0.724‡ | | - | 77.3 | 0.249 | | |
| TV | 9.4 | 0.003‡ | | 2.93 (1.01-8.50)* | 62.5 | 0.198 | | |
| Newspapers | 6.7 | 0.109‡ | | NS | 65.0 | 0.415 | | |
| Magazines | 11.9 | 0.001‡ | | 3.32 (1.03-10.7)* | 69.0 | 0.924 | | |
| Family & friends | 3.8 | 0.377‡ | | - | 65.1 | 0.014 | | |
| Books | 6.9 | <0.001‡ | | 2.74 (0.84-8.90) | 82.8 | 0.025 | | |

There were 27 adverse events reported by 25 respondents; they were most commonly caused by pills/capsules (37%), followed by plasters/dressings (25.9%), ointments/creams (18.5%), and ingestible powders (11.1%) [Fig]. There were no reported adverse events from syrups or tinctures. Allergic reactions, dizziness/disorientation, and gastrointestinal symptoms (such as diarrhoea, stomach ache and cramping) comprised nearly three-quarters of all adverse events reported. Respondents who used OTC TCM for musculoskeletal pain, sleep problems, blood pressure/heart conditions, weight loss, or improving mental functioning were more likely to report adverse events (Table 1).

Professional medical treatment was sought in only one-third of the adverse events (n=8): allergic reaction (n=2), severe nausea (n=1), dizziness (n=1), sleep problems (n=1), stomach ache (n=1), fever (n=1), and exacerbation of influenza-like symptoms (n=1) caused by pill/capsules (n=4), ingestible powders (n=3), and topical ointment/cream (n=1).

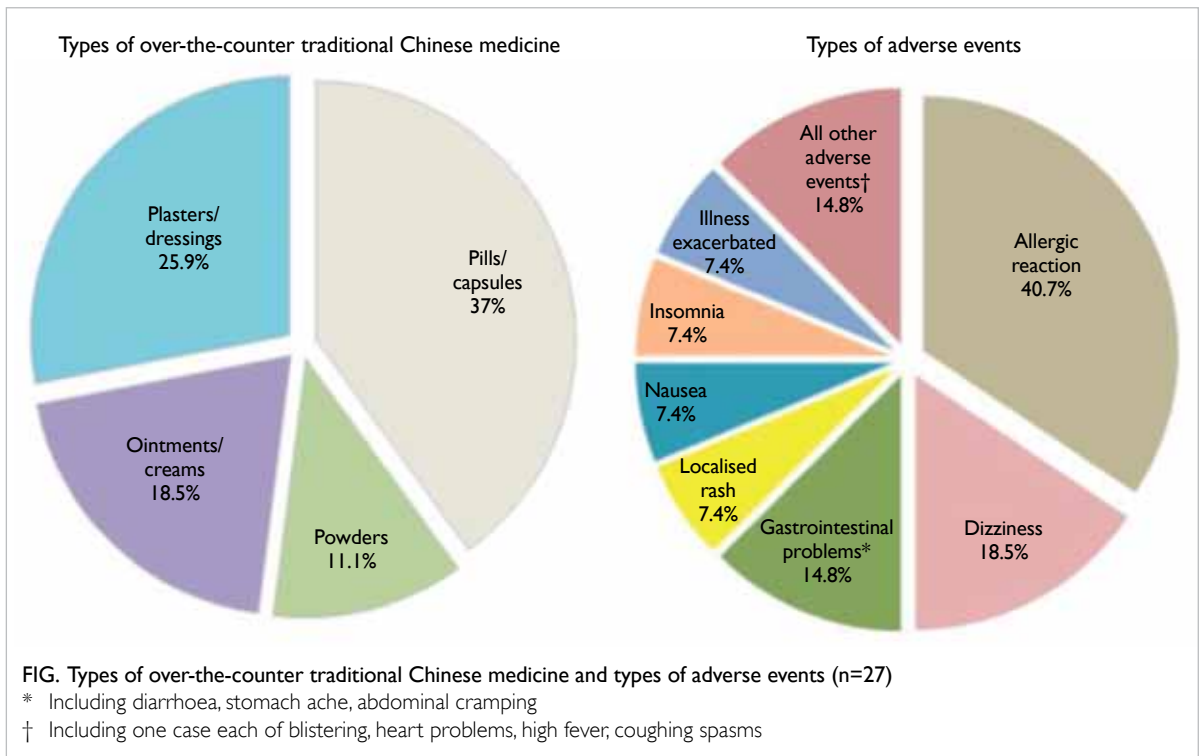
Discussion

The majority of OTC TCM users who experienced adverse events did not seek any professional medical

treatment indicating that these adverse events were an underappreciated public health issue in Hong Kong. Nonetheless, since only one-third of respondents with adverse events sought medical treatment, most adverse events were likely to be mild and self-limiting.

Despite existing labelling regulations, over one third of respondents still found OTC labels to be unclear. This is partly because many of the listed drug actions, such as 'normalising the gall-bladder', require advanced understanding of TCM pathology. Most OTC TCM users self-medicated without consulting a TCM practitioner or seeking OTC information. Unlike western over-the-counter drugs that offer symptom-based treatment, TCM treatment relies upon holistic diagnosis of the underlying syndrome, and the prescribed treatment for a particular symptom may vary greatly between individuals. Given the lower educational status of TCM users in Hong Kong,⁴ there is a potential for inappropriate OTC use of TCM.

The use of an unreliable source of OTC information (eg mass media, magazines) was the primary behavioural risk factor for OTC TCM-related adverse events, rather than lower information-seeking behaviours. In view of the pervasiveness



of low-risk perceptions, these findings suggest that reliance on improved labelling regulations is unlikely to address all OTC-related adverse effects. Strategies for promoting safe OTC TCM drugs use should be included to raise public awareness of drug safety.

The main limitation of this study was the lack of clinical validation of self-reported adverse events; some of which may have been unrelated to their medication use, or simply symptoms of the disease itself. It was also possible that some OTC TCM-related adverse events may not have been recognised as such by users. Even among the valid cases of adverse events that were reported, it was not possible to determine whether poor drug quality, product misuse, or drug interaction was the underlying cause of the adverse event. Moreover, detailed product information was also not obtained from respondents who reported adverse events.

Nonetheless, our study can inform drug policy for governments to implement stricter regulation of alternative medicine. Increased global trade has enabled rapid growth in the availability of OTC products worldwide.⁵ The total output of China's TCM manufacturing industry was US\$13 billion in 2002.⁵ In addition to addressing pervasive OTC TCM misconceptions, there is a need to reduce barriers to reliable drug safety information. Better communication between the TCM manufacturers, retailers, TCM practitioners, and western health professions is required to develop effective safety measures for OTC TCM. The trend towards greater

alternative medicine use necessitates not only stringent labelling regulations and better consumer risk communication, but also improved surveillance of adverse events.

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