Journal of the Formosan Medical Association (2017) 116, 529–535

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jfma-online.com

ORIGINAL ARTICLE

Trends in major opioid analgesic consumption in Taiwan, 2002–2014

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Received 3 May 2016; received in revised form 8 September 2016; accepted 8 September 2016

KEYWORDS
consumption;
defined daily dose;
opioid analgesics;
Taiwan FDA

Abstract *Background/Purpose:* According to WHO guideline, the consumption of opioids is an important sign of national progress in cancer pain relief. However, precise data on the consumption of opioid analgesics consumption in Taiwan has not been published. We investigate opioid analgesic consumption in Taiwan between 2002 and 2014 compare the results with those in other countries to see what we could learn about other methods of pain management. To find out the different patterns between Taiwan and other country, improves the quality of pain management.

Methods: We extracted from the Controlled Drugs Management Information System (CDMIS) database, the consumption data of morphine, fentanyl, and pethidine, three strong opioids, and of codeine and buprenorphine, two weak ones. Data were presented as defined daily doses for statistical purposes per million inhabitants per day (S-DDD/m/d). The number of inhabitants was extracted from the Taiwan Ministry of Interior Statistics population database.

Results: During the thirteen studied years, the total consumption of opioids markedly increased in Taiwan. By category, the consumption of morphine, fentanyl and buprenorphine increased, but the use of pethidine and codeine decreased. Compared with the selected regions and countries, the use of opioid in Taiwan progressed in Asia, but it was still lower than in Western countries.

Conclusion: Opioid analgesics are probable addictive; however, they can improve a patients' quality of life if properly used. The Taiwan FDA continuously introduces new opioid analgesics and educates physicians on how to use them correctly. These measures will improve the quality of pain management in Taiwan.

Conflicts of interest: The authors have no conflicts of interest relevant to this article.

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http://dx.doi.org/10.1016/j.jfma.2016.09.004

Introduction

Pain is the most common reason people seek medical help; it is also a major public health concern.[1] According to the World Health Organization (WHO), the number of cancer patients worldwide has risen dramatically and patients urgently need pain relief in all stage of cancer.[2] Opioid analgesics are the mainstay treatment for cancer pain.[3] Opioid consumption is an important sign of national progress in cancer pain relief.[2] Gilson et al[4] reported that after the WHO announced its three-step analgesic ladder for cancer pain relief in 1986, which encouraged using oral morphine, opioid consumption markedly increased in the western world. However, total opioid consumption in Asian counties, such as Japan, Hong Kong, Korea, and China, is still much lower than in North America and Europe.[5]

Every year, each WHO member country or area submits its opioid consumption data to the International Narcotics Control Board (INCB), which provides international comparisons in its annual report.[5] Unfortunately, because Taiwan is not a member of the WHO, there are no opioid consumption data for Taiwan in the INCB annual report. However, most opioid drugs are controlled substances in Taiwan. To manage the diversion of controlled drugs and confirm the propriety of controlled drug usage, the Taiwan Food and Drug Administration (TFDA) has developed a Controlled Drugs Management Information System (CDMIS).[6] According to the Controlled Drugs Act,[7] all institutions and companies have to use online reporting when they import, export, manufacture, sell, or purchase controlled drugs using the CDMIS. Thus CDMIS can provide data on overall patterns of opioid wholesale levels in Taiwan. Pan et al[8] reported that the average daily opioid consumption in Taiwan lagged far behind those in other developed countries between 2002 and 2007. Nevertheless, opioid consumption in Taiwan has recently rapidly increased.[8] In this descriptive study, we examined the consumption of five major opioid analgesics (fentanyl, morphine, pethidine, buprenorphine, and codeine) on a wholesale level in Taiwan and made multi-country comparisons using the official data from the INCB.

Materials and methods

Our data source was the CDMIS database. Official data from other Asian countries—Japan, Hong Kong, and China—were also used for the comparison.

To analyze the five major opioid analgesics, we divided them into two categories: strong (morphine, fentanyl, and pethidine); and weak (buprenorphine and codeine). Data were converted into defined daily doses for statistical purposes per million inhabitants per day (S-DDD/m/d). The number of Taiwan's inhabitants at midyear was extracted from the Taiwan Ministry of Interior Statistics population database. International mean DDD values from the INCB are shown in Table 1. The formula was calculated as follows:

$$\frac{\text{annual opioid consumption (mg)}}{\text{DDD (mg)} \times \text{inhabitants (million)} \times 365\text{ (days)}} \quad \text{(Eq.1)}$$

Although some studies have reported that oral morphine equivalents are more useful than S-DDD/m/d for analyzing opioid consumption,[9–11] Lu et al[12] stated that the S-DDD formula (Eq. 1) could compare not only single drugs and multidrugs, but also the wholesale level of opioid consumption. Moreover, S-DDD is commonly used in INCB publications.[5] Thus, we chose this method for our study.

Table 1 Defined daily doses (DDD) values in mg from the International Narcotics Control Board.

Drug	DDD (route)
Morphine	30 mg (parenteral)
	100 mg (oral)
Fentanyl	0.6 mg (parenteral, oral)
Pethidine	400 mg (parenteral, oral)
Buprenorphine	1.2 mg (sublingual)
	8 mg (sublingual, for heroin substitution)
Codeine	240 mg (parenteral, oral)
	100 mg (oral, cough suppressant)

Results

Trends in the total consumption of opioid drugs in Taiwan, 2002–2014

Consumption of these opioid drugs between 2002 and 2014 rose by 41%: from 631.2 S-DDD/m/d to 889.5 S-DDD/m/d (Table 2). Morphine, fentanyl, and buprenorphine consumption rose, but codeine and pethidine fell. Furthermore, buprenorphine consumption accounted for the largest increase: from 6.5 S-DDD/m/d in 2002 to 81.5 S-DDD/m/d in 2014 (12.54 times more). In 2002, codeine consumption was 272.7 S-DDD/m/d; it was the most consumed opioid and accounted for 43.2% of total consumption. In 2014, however, fentanyl consumption was 509.2 S-DDD/m/d; it had replaced codeine as the most consumed opioid and accounted for 57.2% of total opioid consumption.

Between 2002 and 2014, the consumption of strong opioids markedly increased from 352.0 S-DDD/m/d to 734.4 S-DDD/m/d (Fig. 1), and that of weak opioids decreased from 279.2 S-DDD/m/d to 155.1 S-DDD/m/d.

The consumption of each opioid drug during the 13-year period

The consumption of strong opioids increased during the 13-year period between 2002 and 2014. The consumption of morphine (+121.7%) and fentanyl (+119.8%) steadily increased, and of pethidine decreased (−41.2%; Fig. 2A). The changes in the consumption of weak opioids during 2002–2014 by category were: total consumption decreased (−44.4%) based on the decreasing usage of codeine (−73.0%; Fig. 2B). Buprenorphine consumption markedly increased (+1153.8%) and surpassed codeine consumption in 2014. However, codeine consumption for pain relief was stable (+2.0%).

Comparisons the total opioid consumption between Taiwan and other regions

The North America region (10,814 S-DDD/m/d) consistently had the highest total opioid consumption of all