A B S T R A C T

Introduction: The number of patients undergoing total hip replacement surgeries has increased as a result of a rise in the ageing population. This study reviewed the demographics and disease spectrum leading to primary total hip replacement in the Chinese population from 1998 to 2010.

Methods: This case series was conducted in a university teaching hospital in Hong Kong. Data from the prospective joint registry of all patients who underwent primary total hip replacement from January 1998 to December 2010 were reviewed. Patients’ age and sex, diagnosis, as well as the Harris Hip Scores before operation and at the last follow-up were described.

Results: There were 512 primary total hip replacements performed on 419 patients (43.4% males) during the study period. All had clinical follow-up for at least 2 years. The mean age of the patients was 57.6 (standard deviation, 16.6) years. In males, the main aetiology was osteonecrosis (50.9%), ankylosing spondylitis (19.5%), and post-traumatic arthritis (8.5%). For females, it was osteonecrosis (33.0%), primary osteoarthritis (18.8%), and post-traumatic arthritis (15.8%). Alcohol-induced (52.5%) and idiopathic (40.7%) was the most common cause of osteonecrosis in males and females, respectively. The mean preoperative Harris Hip Score and that at last follow-up was 43.9 (standard deviation, 18.3) and 89.7 (standard deviation, 13.0), respectively.

Conclusions: Osteonecrosis was the most common aetiology leading to total hip replacement although there were different causes in both sexes leading to it. The clinical result in terms of Harris Hip Score was good for all patients who required total hip replacement.

New knowledge added by this study
• This study updates the disease pattern and epidemiology underlying the need for primary total hip replacement (THR) in our local Hong Kong population. In addition, the different causes leading to osteonecrosis of the hip were analysed.

Implications for clinical practice or policy
• The results of this study could have major implications on public health. They reveal that alcohol and its related health hazards remain a major health concern in Hong Kong. Study of the epidemiology of primary THR may enable us to better allocate our health care resources.

Introduction
Arthritis is a common clinical condition and its prevalence is increasing worldwide. More than 20% of the United States population suffer from arthritis, and it is estimated that one in four may develop symptomatic hip osteoarthritis in their lifetime. It is an important clinical problem and a major burden on the health care system. Total hip replacement (THR) significantly improves quality of life and functional disability. The number of THR surgeries has been increasing all around the world over the past 10 years. Osteoarthritis is the most common indication for THR in Caucasian populations. According to the Annual Report 2013 of the National Joint Registry for England, Wales and Northern Ireland, osteoarthritis was the most common cause of primary THR across all age-groups, accounting for more than 90% of those aged 50 years and above. Overall, 79.2% of primary THRs from 1992 to 2011 in the Swedish population were due to primary osteoarthritis, with a decreasing trend observed in THR for inflammatory arthritis. As the prevalence of hip osteoarthritis is lower in Asians, the disease pattern for THR would also be expected to differ. A review of primary total hip arthroplasty (THA)
Results

A total of 512 THR surgeries were performed on 419 Chinese patients at QMH from January 1998 to December 2010. Of the cases, 43.4% were males and 48.4% were left hips. The mean (± standard deviation) age at the time of operation was 57.6 ± 16.6 years. The mean Harris Hip Score at the last follow-up increased significantly compared with that preoperatively (89.7 ± 13.0 vs 43.9 ± 18.3; paired t test, P<0.05) [Table 1].

Osteonecrosis was the most common cause of primary THR in both males and females in our study population, accounting for 50.9% and 33.0%, respectively. The second most common cause was ankylosing spondylitis in males (19.5%) and osteoarthritis in females (18.8%). Post-traumatic arthritis was the third most common cause in both males (8.5%) and females (15.8%). Rheumatoid arthritis accounted for 2.5% of primary THRs in males and 9.4% in females. Dysplasia contributed to 4.1% and 8.0% of primary THRs in males and females, respectively (Table 2).

The underlying causes of osteonecrosis in females and males were further analysed. The cause of osteonecrosis was entered by the operating surgeon based on medical records, as well as clinical, radiological, and intra-operative findings. The most common cause of osteonecrosis was alcoholism in males (52.5%) and idiopathic osteonecrosis in females (40.7%).

### Methods

All patients who underwent primary THR at Queen Mary Hospital (QMH), a university teaching hospital in Hong Kong, from January 1998 to December 2010 were reviewed. Diagnosis was made according to clinical, radiological, and intra-operative findings and entered by the surgeon. Non-Chinese patients were excluded from further analysis. Patients’ age and sex, diagnosis, preoperative and latest Harris Hip Scores at follow-up were analysed. All patients had clinical follow-up for at least 2 years. The causes of THR were then compared with the data from 1972 to 1997. Chi squared test and Student's t test were used for statistical analysis.

### Table 1. Demographics of primary total hip replacement in Chinese patients at Queen Mary Hospital from 1998 to 2010

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Data*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. of patients</td>
<td>419</td>
</tr>
<tr>
<td>Total No. of hips</td>
<td>512</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>43.4%</td>
</tr>
<tr>
<td>Female</td>
<td>56.6%</td>
</tr>
<tr>
<td>Laterality</td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>48.4%</td>
</tr>
<tr>
<td>Right</td>
<td>51.6%</td>
</tr>
<tr>
<td>Age (years)</td>
<td>57.6 ± 16.6 (22-96)</td>
</tr>
<tr>
<td>Harris Hip Score</td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>43.9 ± 18.3 (9-97)</td>
</tr>
<tr>
<td>At last follow-up</td>
<td>89.7 ± 13.0 (49-100)</td>
</tr>
</tbody>
</table>

* Data are shown as No., %, or mean ± standard deviation (range)
females (40.7%). Steroid-induced and idiopathic osteonecrosis was the second and third most common causes in males, accounting for 26.7% and 15.0%, respectively. In females, steroid-induced and post-traumatic osteonecrosis was the second and third most common causes, accounting for 29.7% and 23.1%, respectively (Table 3).

Our data were compared with the results from a previous study from 1972 to 1997 of primary THR in the Chinese patients. We concluded that osteonecrosis remains the most common cause of primary THR in the Chinese population. Other common causes, such as post-traumatic arthritis, ankylosing spondylitis and osteoarthritis, showed no statistically significant changes. The percentage of primary THR in the Chinese population due to rheumatoid arthritis, however, has increased significantly from 3.3% to 6.3% (P=0.025; Table 4).

Discussion

Total hip replacement is a well-established surgical procedure for end-stage arthritis. The number of THR surgeries is increasing worldwide in parallel with the rising number of patients with advanced arthritis. This will place a huge socio-economic burden on our health care system in the future. Study of the epidemiology and diseases underlying the need for THR might help reduce the number of patients who progress to advanced arthritis, and in so doing, reduce the burden on our health care system. In our local community, osteonecrosis was the most common cause of primary THA from 1972 to 2010. Alcoholism was the most common underlying aetiology of osteonecrosis in men, accounting for more than 50% of cases. It is evident that alcoholism remains a major social and health issue in Hong Kong. The World Health Organization defines alcoholism as chronic and continual drinking or periodic consumption of alcohol, characterised by impaired self-control, frequent intoxication, and use of alcohol despite adverse consequences. There is no exact alcohol level that defines alcoholism. Alcoholism was identified as the cause of osteonecrosis in our studied patients according to the clinical context and patient’s social history. The importance of alcoholism in Hong Kong is further echoed by a publication by the Department of Health stating that alcohol consumption per capita has risen from 2004 to 2010. The prevalence of adult and underage drinking also increased between 2005 and 2010. More than 15% of drinkers in Hong Kong drank beyond the recommended daily limit in 2010. Local and global strategies are needed to tackle alcoholism and its associated health problems.

Although alcohol is a well-known risk factor for development of osteonecrosis, the pathogenesis and dose-response relationship are less established. Pathological studies in rabbits show that marrow fat cell hypertrophy and proliferation, thinning of trabecular, and increased empty osteocyte lacunae are observed in alcohol-induced osteonecrosis. Previous studies proposed that the alcohol exposure threshold for osteonecrosis in humans is 150 L of 100% ethanol, consumed at a rate of 400 mL of absolute ethanol weekly. More studies, however, are needed to understand the dose and duration effect of alcohol-induced osteonecrosis.

The Swedish Hip Arthroplasty Register, one of the earliest registries, is an excellent resource to study the demographic pattern of joint replacement.
in Caucasians. According to their Annual Report 2011, the number of primary THRs steadily increased from 14,312 in 2007 to 15,945 in 2011.11 Primary osteoarthritis of the hip has been the most common cause of THA in Sweden for more than 20 years, accounting for 83% in 2011, while idiopathic osteonecrosis only contributed to 3.2% in 2011.12 On the contrary, our study showed that osteonecrosis is the most common cause of THR in the Chinese population and osteoarthritis accounts for only 12.5%. Such discrepancy is also observed in other studies in Asian populations. A recent publication in India found that osteonecrosis was the most common indication for THR, accounting for 49% of those performed from 2006 to 2012.21 In Singapore, 42% of THRs were due to osteonecrosis from 2004 to 2006.22 Although the exact underlying mechanism is unclear, the prevalence of hip osteoarthritis has been shown to be lower in Orientals than Caucasians.13

The proportion of primary THR performed in Sweden for inflammatory arthritis decreased over a period of 5 years, from 2.08% in 2007 to 1.51% in 2011.11 In the Hong Kong population, however, the proportion of THR performed for rheumatoid arthritis increased between 1972-1997 and 1998-2010. We postulate that such discrepancy is due to our delay in adopting an early strict treatment strategy for rheumatoid arthritis. It has been shown by various studies that joint destruction occurs early in the course of rheumatoid arthritis.23-24 Early disease control is essential to prevent joint destruction and hence, need for joint replacement surgery. Such a concept had been incorporated in the European League Against Rheumatism treatment guideline of 2007.25 Despite this, it is only recently that the Hong Kong Society of Rheumatology has modified the local treatment guidelines on rheumatoid arthritis.26 Future epidemiological study might be needed to observe any changes in primary THR requirement for rheumatoid patients.

In this study, the disease leading to THR was entered by the operating surgeon based on clinical, radiological, and intra-operative assessments. Nonetheless, the underlying aetiology is sometimes difficult to determine in patients with end-stage arthritis and those with multiple risk factors. This causes possible information bias, and is a limitation of this study.

All data within the study period were pooled for analysis. Hence, any significant changes within the period from 1998 to 2010 might have been missed. In addition, data from this study were limited to a regional hospital in Hong Kong and generalisation of the results to the present Chinese population might not be accurate. A total of 15 hospitals were performing THR within the study period, and QMH accounted for 15% of surgeries. As a university teaching hospital, QMH also serves as a tertiary and quaternary referral centre in Hong Kong, and may therefore encounter a different disease spectrum compared with peripheral hospitals in Hong Kong. We believe a territory or nationwide joint registry, such as the Swedish Hip Arthroplasty Register or National Joint Registry (for England, Wales, Northern Ireland), is needed for more representative results. In view of the rising number of patients who suffer from advanced arthritis and hence, the rising number of joint replacement surgeries, the setting up of a joint registry is important for further research and budgeting of our health care resources.

References


Corrigenda

“Childhood intussusception: 17-year experience at a tertiary referral centre in Hong Kong” (December 2015;21:518-23). In this paper, the name of the fifth author was given incorrectly. The correct name should be “Wendy WM Lam” instead of “Wendy MW Lam”, and the corresponding Chinese name should be “林慧文” instead of “林文慧”. We regret the error. The article is correct at www.hkmj.org.