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National Hip Fracture Incidence – Past, Present and Future Projections

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Abstract

Aims

Hip fractures are a significant source of morbidity and mortality, with occurrences set to increase as our population continues to age. The aim of this study is to determine the current and future incidence of hip fractures in Ireland based on predicted population growth.

Methods

A search was performed of the Irish Hip Fracture Database to identify all hip fracture patients, aged over 60, from 2017-2019. Data on the current population, as well as projections up to 2046, were obtained from the Central Statistics Office, so as to determine projected hip fracture incidence in the coming decades.

Results

The incidence of hip fractures, in the Irish population aged over 60, was an average of 389.3 per 100,000 from 2017-2019. Annual hip fracture numbers are expected to increase by at least 158.8% by 2046, assuming a stable incidence rate.

Conclusion

The age and gender specific incidence of hip fractures in Ireland in those over 60 has remained stable compared to previous years. However, this study projects there will be a significant increase in hip fractures in Ireland in the coming decades and there will need to be appropriate resource allocation within future healthcare budgets.

Introduction

Hip fractures remain a source of morbidity and mortality in older patients, despite advances in prevention and treatment[1]. Associated lengthy hospital admissions result in hip fractures carrying a significant economic healthcare burden[2]. Greater awareness of hip fracture epidemiology would help prepare healthcare systems and ensure appropriate resources are in place to efficiently manage such complex injuries. The literature has consistently demonstrated that hip fracture rates are projected to increase further as populations age internationally[3, 4]. The general trends of hip fracture epidemiology are widely understood, including a high proportion among postmenopausal women and those with poor nutritional status[5, 6]. Possible explanations for differing incidence rates between regions include variations in the proportions of the elderly within a population, the incidence and treatment of osteoporosis and hip fracture prevention programmes. Furthermore, major hip fracture risk factors such as alcohol consumption and smoking are more common in certain countries as opposed to others[7, 8].

In Ireland, hip fractures are more commonly seen in females at a 2.9:1 ratio compared to men[9]. Comparison with other countries found that the rate and gender balance of fractures in Ireland was in line with other international registries[9]. A study of patients admitted to hospital with hip fractures in Ireland revealed high costs associated with the injury, mostly due to the length of hospital stay. It was found that mean total hospital expenditure per patient was €9236.01 in 2008[10]. A recent study on trends of fragility fractures in Ireland found that the absolute number of fractures increased by 30% from 2000 to 2014 with hip fractures accounting for 36.5% of all fragility fracture admissions[11]. Furthermore, it was projected that annual hip fracture numbers in Ireland could increase by 100% by the year 2026[9]. The aim of this study is to determine the current incidence of hip fractures in Ireland and to predict future incidences based on predicted population growth beyond the published literature to date.

Methods

A retrospective, population based observational study was performed, using the Irish Hip Fracture Database (IHFD), assessing all hip fractures in patients aged over 60 years throughout the period from 2017-2019. The IHFD is a clinically led, online-based audit collecting data via the Hospital Inpatient Enquiry (HIPE) system. HIPE is the main source of demographic, clinical and administrative information on all discharges and deaths from publicly funded acute hospitals in Ireland and is managed by the national Healthcare Pricing Office (HPO)[12]. The IHFD collects data on hip fractures aged over 60 years from 16 participating hospitals, with national coverage of 95% of hip fractures in 2017 and 99% thereafter. Eligible cases are identified by the local audit coordinator of each participating hospital. Information collected includes patient demographics, fracture classification, time of admission and discharge, time of surgery, operation performed and length of stay.

Data on the population of the Republic of Ireland from 2017-2019 was obtained from the Central Statistics Office (CSO)[13]. For those aged over 60 years, population details were obtained for age-specific groups of both males and females, allowing calculation of age and gender-specific fracture incidence. The projected population of the Republic of Ireland in 2026, 2036 and 2046 was obtained from the CSO to allow projected hip fracture calculations. Projected populations made use of immigration, fertility, and mortality parameters with an aggressive M1F1 estimate and conservative M3F2 estimate. Both estimates were used to calculate ranges for projected hip fractures in 2026, 2036 and 2046.

Results

10,744 hip fractures were identified and included in this study (Table 1). The population of those aged over 60 in the Republic of Ireland increased from 892,200 in 2017 to 950,100 in 2019, with males accounting for 47.5% of the population in 2017, and 47.7% 2019. The absolute number of hip fractures per year in Ireland remained stable from 2017 to 2019, with an annual average of 3581 (range 3467–3763). The number of reported hip fractures in the Irish population aged over 60 per 100,000 from 2017 to 2019 remained consistent, with an average of 389.3.

The average number of hip fractures per year increased sequentially throughout successive age groups (Table 2). The largest increase in average fracture number between age groups was identified from age group 80-84 to 85+. Average annual male and female fracture rates per 100,000 increased consecutively with age during the study period.

With respect to gender, from 2017-2019, overall female hip fracture rates per 100,000 was consistently higher than that of males (Table 1) and showed consistency across all age groups (Table 2). The female-to-male ratio of average hip fracture incidence per 100,000 across age groups increased from 1.79:1 in those aged 60-64 to 1.91:1 in the 75-79 group, before falling to 1.53:1 in those aged 85+ (Table 2).

In terms of projected hip fracture numbers, based upon estimated total population numbers for 2026-2046 using conservative (M3F2) and aggressive (M1F1) CSO estimates, projected total hip fractures for 2026-2046 were calculated along with current and expected age adjusted rates (Table 3) (Table 4). Concerning conservative and aggressive immigration and fertility scenarios, expected absolute hip fracture numbers of 4809.8 to 4856.9 in 2026, 6968.2 to 7079.4 in 2036, and 9268.6 to 9502.9 in 2046 were projected.

Table 1: *Male and female over 60 years of age hip fracture total per year.*

Year	Hip Fracture Total	Population	Incidence (per 100,000)	Male Hip Fracture No	Male Population	Male Hip Fracture Incidence	Female Hip Fracture No	Female Population	Female Hip Fracture Incidence
2017	3514	892200	393.9	1032	423800	243.5	2482	468100	530.2
2018	3763	920000	409	1176	437900	268.6	2587	481800	536.9
2019	3467	950100	364.9	1071	452800	236.5	2396	497400	481.7

Table 2: *Age specific breakdown: 2017-2019.*

Age Group	Average Total Fracture Number Per Year	Average Annual Male Frac Number	Average Annual Male Population	Average Annual Male Fracture Rate (per 100,000)	Average Annual Female Frac Number	Average Annual Female Population	Average Annual Female Fracture Rate
60-64	185	65.7	122967	53.4	119.3	124567	95.8
65-69	294.3	107.3	106667	100.6	187	108733	172
70 -74	470.7	163.7	87033	188	307	90200	340.4
75-79	575.7	184.3	57767	319	391.3	64267	608.9
80-84	761.7	226.7	37467	605	535	47633	1123.2
85+	1294	345.3	26266	1314.6	948.7	47033	2017.1

Table 3: *Projected total hip fractures by age 2026-2046 (M1F1 aggressive population estimate).*

	2017-2019		2026		2036		2046	
Age Group	Average number hip fractures per year	Average population per year	Projected population	Projected hip fracture numbers	Projected population	Projected hip fracture numbers	Projected population	Projected hip fracture numbers
60-64	185	247533	289100	216.1	349200	261	379400	283.6
65-69	294.3	215467	254700	347.9	308000	420.7	381600	521.2
70 -74	470.7	177233	217100	576.6	269500	715.7	328800	873.2
75-79	575.7	122067	177200	835.7	223200	1052.7	275200	1297.9
80-84	761.7	85133	120000	1073.7	170300	1523.7	219100	1960.3
85+	1294	73333	102400	1806.9	176000	3105.6	258800	4566.7
Total	3581.4	920766	1160500	4856.9	1496200	7079.4	1842900	9502.9

Table 4: *Projected total hip fractures by age 2026-2046 (M3F2 conservative population estimate).*

	2017-2019		2026		2036		2046	
Age Group	Average number hip fractures per year	Average population per year	Projected population	Projected hip fracture numbers	Projected population	Projected hip fracture numbers	Projected population	Projected hip fracture numbers
60-64	185	247533	286300	214	340200	254.3	352600	263.5
65-69	294.3	215467	252300	344.6	302000	412.5	363700	496.8
70 -74	470.7	177233	215100	571.3	264800	703.3	318300	845.3
75-79	575.7	122067	175700	828.6	219700	1036.2	268500	1266.3
80-84	761.7	85133	118900	1063.8	167700	1500.4	214400	1918.3
85+	1294	73333	101300	1787.5	173500	3061.5	253800	4478.4
Total	3581.4	920766	1149600	4809.8	1467900	6968.2	1771300	9268.6

Discussion

An annual mean of 3581 hip fractures was identified within the Irish population, aged over 60, between the years of 2017 and 2019. The incidence of hip fractures remained stable at an average of 389.3 per 100,000 across the study period. Hip fractures rates increased with age and was higher for females across all age groups. Despite total hip fracture numbers increasing, the incidence of hip fractures across age groups remained similar to what was seen in Ireland between 2000 and 2004, whilst decreasing in the 85+ group from 2456.2 to 2017.1 per 100,000[9].

Comparison of our findings to previously projected rates using national hip fracture data between 2000 and 2004 revealed that the absolute number of hip fractures were fewer than conservative (M2F3) estimates[9]. Dodds et al. projected 3763 hip fractures in those over the age of 60 in 2016, whilst our study found an average of 3581 between 2017 and 2019. The incidence for 2016 was projected at 412.9 per 100,000 whilst our study demonstrated 389.3 per 100,000 between 2017 and 2019. In 2000-2004, 34% of hip fractures in those over the age of 60 occurred in the 85+ group. Dodds et al projected that 35% of hip fractures would occur in the 85+ group, which was in line with our findings of 36%.

Potential explanations for lower total fracture number and incidence begin with significant improvement in the diagnosis and management of osteoporosis. The development and implementation of assessment tools, such as FRAX, have allowed for improved bone health screening[14]. It has also been found that the prescription of vitamin D and calcium has increased over recent years in Ireland [15]. Furthermore Zaidi et al. demonstrated the Irish population to be the 6th most active population in Europe in terms of the Active Aging Index, describing how Irish people are more likely to engage in weight bearing activity shown to reduce rates of osteoporosis[16].

Apart from highlighting the benefits of primary hip fracture prevention, the IHFD has driven improvements in osteoporosis management, and secondary prevention, thus reducing such musculoskeletal events. One of the key standards assessed by the IHFD is the proportion of patients receiving bone health assessments post fragility fracture diagnosis[17]. Significant improvements were seen in the proportion of patients commenced on bone protection medication, rising from 39% in 2014 to 71% in 2019[17, 18]. The IHFD also drove improvements in the proportion of hip fracture patients receiving an inpatient falls assessment, from 49% in 2014 to 83% in 2019[17, 18].

Compared to international registries, the hip fracture incidence reported in this study of 389.3 per 100,000 was similar to that of 399 in the UK[19]. The incidence of hip fractures per 100,000 from 2011-2013 in France was an average of 597.2 amongst women, and 230.7 amongst men[20]. The same figures in Ireland from 2017-2019 were 516.2 for women and 249.5 for men. One study in the United States found that in women aged over 65, there was an average hip fracture incidence rate of 741 per 100,000 between 2013 and 2015. Meanwhile in Ireland, the incidence among women over the age of 65 was 662 between 2017 and 2019[3]. Such comparisons demonstrate that hip fracture rates in Ireland have been consistently lower compared to the United States, and to that of European countries.

Projections for future hip fracture rates in this study are based on population demographics and the assumption of a stable age-specific incidence rate. Such projections do not account for changes in age-specific hip fracture rates. In spite of this, even the most conservative projections suggest an increase in hip fractures in those over the age of 60 of 34.2% (1228.4 fractures) by 2026, 94.5% (3386.8 fractures) by 2036 and 158.8% (5687.2 fractures) by 2046. Aggressive estimates suggest an increase of 165.3% (5921.5 fractures) by 2046. Furthermore, it is projected that in hip fractures over 60 (conservative estimates), 43.9% will be in the 85+ group by 2026, rising to 48.3% by 2046, from 36% between 2017 and 2019. Appropriate resource allocation in future healthcare budgets should anticipate this increased burden of hip fracture care. Accounting for the significant rise in hip fracture rates within the oldest, frailest group of 85+ is mandatory with workforce and service expansion. The 2018 IHFD national report found that 40% of patients aged 60-69 were assigned an American Society of Anaesthesiologists (ASA) Grade of 3 or 4, compared with almost 75% of patients aged 90 or over, indicating that as age increases, so does medical complexity[21]. Provision will need to account for this dependent cohort, with significant care demands and resource-intensive hospital episodes. Moreover, older patients are more likely to sustain a second hip fracture which will further impact available healthcare resources[22]. It will also be necessary to improve rehabilitation access for hip fracture patients so as to improve throughput, limit the mean length of stay and reduce the rates of long-term care referrals[23].

Limitations to this study include the use of retrospective data which can be subject to errors in data capture[24]. Another limitation is that national coverage of hip fractures by the IHFD in 2017 was 95% although it improved to 99% in 2018-2019. Furthermore, as the data is collected by multiple professionals across 16 hospitals, there is potential for variation in the interpretation of certain variables. However, the risk of this occurring is minimised through the central coordination of the audit and other protocols such as continual education and support for data collectors[25].

Age and gender specific hip fracture incidences have remained stable in Ireland and have outperformed previously projected figures. Furthermore, Ireland's hip fracture incidence is in line with other European countries and is lower than that seen in the United States. Projections suggest that there will be a significant increase in hip fractures in Ireland in the coming decades with up to 7079.4 fractures occurring in 2036 and 9502.9 in 2046. Appropriate resource allocation in future healthcare budgets, facilitating workforce and service expansion, will serve as an essential step in anticipating and managing the expected hip fracture tidal wave, amongst an increasingly complex patient cohort, as our population continues to actively age.

Declaration of Conflicts of Interest:
The authors have no conflicts of interest to declare.

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