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PELVIC INJURIES IN SEMEY CITY: CROSS-SECTIONAL STUDY

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Abstract

Introduction: pelvic injuries as part of a combined injury are a serious medical problem, the mortality rate from which, according to various authors, reaches 60% [1, 4] (Adam Starr, Joseph P. Miney, 2002). Although the prevalence of pelvic injuries is relatively low, accounting for about 16% of the total number of injuries [16], unstable pelvic fractures accompanied by shock and bleeding are particularly dangerous [20]. Only a limited number of publications are devoted to the epidemiology of pelvic injuries, including an analysis of the age and sex distribution of patients [14], the circumstances of the injury, anatomical localization of injuries, and other characteristics [3]. The purpose of this study is to conduct an epidemiological analysis of patients with pelvic bone injuries admitted to the emergency hospital in Semey, East Kazakhstan region (Kazakhstan).

Material and methods: This study is a descriptive retrospective study within a single educational institution. The work was carried out within the framework of the grant financing of the project of the Ministry of Education and Science of the Republic of Kazakhstan: IRN AP05135531 “Development of a system of ortho-surgical rehabilitation of pelvic bone injuries in road accidents in the Republic of Kazakhstan.” A cross-sectional study was conducted. It included all cases of pelvic injuries (N = 250) for the period from 01.01.2013 to 31.12.2017.

Results: The study included the results of an examination of 250 victims with pelvic bone injuries who underwent inpatient treatment at the Semey State Emergency Hospital from 01.01.2013 to 31.12.2017. 46.8% (117 people) of the victims were men, 53.2% (133 people) were women. Pelvic bone injuries were reported during the year: 20.8% (N = 52) in spring, 24.4% (N = 61) in winter, 22.4% (N = 56) in summer, and 32.4% (N = 81) in autumn. 93.2% (N =233) of the victims did not require surgical treatment, and 6.8% (N =17) were treated surgically. 97.2% (N = 243) of the injured were discharged.

Conclusion: Traffic accidents and falls from heights are the main causes of pelvic injuries, which highlights the need for stricter traffic rules compliance. The distribution of injuries according to the AO-Tile classification showed a predominance of type A (54.4%) and type B (41.2%).

Keywords: *pelvic injuries, pelvic ring fractures, epidemiology.*

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Резюме

РАСПРОСТРАНЕННОСТЬ ПОВРЕЖДЕНИЙ ТАЗА В ГОРОДЕ СЕМЕЙ: ПОПЕРЕЧНОЕ ИССЛЕДОВАНИЕ

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Введение: травмы таза как часть сочетанной травмы являются серьезной медицинской проблемой, смертность от которой, по данным различных авторов, достигает 60% [1, 4] (Адам Старр, Джозеф П. Миней, 2002). Хотя распространенность травм таза относительно невелика и составляет около 16% от общего числа травм [166], нестабильные переломы таза, сопровождающиеся шоком и кровотечением, особенно опасны [20]. Лишь ограниченное число публикаций посвящено эпидемиологии травм таза, включая анализ возрастного и полового распределения пациентов [14], обстоятельств травмы, анатомической локализации повреждений и других характеристик [3]. Целью данного исследования является проведение эпидемиологического анализа пациентов с травмами костей таза, госпитализированных в больницу скорой медицинской помощи города Семей Восточно-Казахстанской области (Казахстан).

Материал и методы: Данное исследование представляет собой описательное ретроспективное исследование в рамках одного учебного заведения. Работа выполнена в рамках грантового финансирования проекта Министерства образования и науки Республики Казахстан: IRN AP05135531 “Разработка системы ортохирургической реабилитации травм костей таза при дорожно-транспортных происшествиях в Республике Казахстан”. Было проведено поперечное исследование. В него были включены все случаи травм таза (N = 250) за период с 01.01.2013 по 31.12.2017.

Результаты: В исследование были включены результаты обследования 250 пострадавших с травмами костей таза, которые проходили стационарное лечение в Государственной больнице скорой медицинской помощи города Семей за период с 01.01.2013 по 31.12.2017 г. 46,8% (117 человек) пострадавших составили мужчины, 53,2% (133 человека) - женщины. В течение года были зарегистрированы случаи травм костей таза: 20,8% (N = 52) весной, 24,4% (N = 61) зимой, 22,4% (N = 56) летом и 32,4% (N = 81) осенью. 93,2% (N =233) пострадавших не нуждались в хирургическом лечении, 6,8% (N =17) были пролечены хирургическим путем. 97,2% (N = 243) пострадавших были выписаны.

Вывод: Основными причинами травм таза являются дорожно-транспортные происшествия и падения с высоты, что подчеркивает необходимость более строгого соблюдения правил дорожного движения. Распределение травм в соответствии с классификацией AO-Tile показало преобладание типа A (54,4%) и типа B (41,2%).

Ключевые слова: *травмы таза, переломы тазового кольца, эпидемиология.*

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Түйіндеме

ЖАМБАС ЖАРАҚАТТАРЫНЫҢ СЕМЕЙ ҚАЛАСЫНДАҒЫ ТАРАЛУЫ: КӨЛДЕНЕҢ ЗЕРТТЕУ

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Кіріспе: біріктірілген жарақаттың бөлігі ретінде жамбас жарақаттары ауыр медициналық проблема болып табылады, оның өлімі әр түрлі авторлардың пікірінше 60% жетеді [1, 4] (Адам Старр, Джозеф П.Миней, 2002). Жамбас жарақаттарының таралуы салыстырмалы түрде аз және жалпы жарақаттардың шамамен 16% құрайды [16], шокпен және қан кетумен бірге жүретін тұрақсыз жамбас сынықтары әсіресе қауіпті [20]. Тек шектеулі басылымдар жамбас жарақаттарының эпидемиологиясына, соның ішінде пациенттердің жас және жыныстық

таралуын талдауға [14], жарақат жағдайларына, зақымданудың анатомиялық орналасуына және басқа сипаттамаларға арналған [3]. Бұл зерттеудің мақсаты Шығыс Қазақстан облысы (Қазақстан) Семей қаласының Жедел медициналық жәрдем ауруханасына жатқызылған жамбас сүйектері жарақаттанған пациенттерге эпидемиологиялық талдау жүргізу болып табылады.

Материал және әдістер: бұл зерттеу бір оқу орнындағы сипаттамалық ретроспективті зерттеу болып табылады. Жұмыс Қазақстан Республикасы Білім және ғылым министрлігінің: IRN AP05135531 "Қазақстан Республикасында жол-көлік оқиғалары кезінде жамбас сүйектерінің жарақаттарын ортохирургиялық оңалту жүйесін әзірлеу" жобасын гранттық қаржыландыру шеңберінде орындалды. Көлденең зерттеу жүргізілді. Оған 01.01.2013-31.12.2017 жылдар аралығында жамбас жарақаттарының барлық жағдайлары (N = 250) енгізілді.

Нәтижелері: зерттеуге 01.01.2013 - 31.12.2017 ж.аралығында Семей қаласының мемлекеттік жедел медициналық жәрдем ауруханасында стационарлық емдеуден өткен жамбас сүйектерінің жарақаты бар 250 зардап шегушіні тексеру нәтижелері енгізілді. зардап шеккендердің 46,8% - ы (117 адам) ерлер, 53,2% - ы (133 адам) әйелдер. Бір жыл ішінде жамбас сүйектерінің зақымдану жағдайлары тіркелді: көктемде 20,8% (N = 52), қыста 24,4% (N = 61), жазда 22,4% (N = 56) және күзде 32,4% (N = 81). Зардап шеккендердің 93,2% (N =233) хирургиялық емдеуді қажет етпеді, 6,8% (N =17) хирургиялық жолмен емделді. Зардап шеккендердің 97,2% (N = 243) шығарылды.

Қорытынды: жамбас жарақаттарының негізгі себептері жол-көлік оқиғалары мен биіктіктен құлау болып табылады, бұл жол ережелерін қатаң сақтау қажеттілігін көрсетеді. Ao-Tile классификациясына сәйкес жарақаттардың таралуы А типінің (54,4%) және В типінің (41,2%) басым екенін көрсетті.

Түйінді сөздер: *жамбас жарақаттары, жамбас сақинасының сынуы, эпидемиология.*

Дәйексөз үшін:

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Introduction

Currently, pelvic injuries as part of combined trauma represent a significant challenge for modern medicine due to their complex nature, high risk of complications, and elevated mortality rates. According to various authors, mortality in patients with unstable pelvic fractures, especially when associated with hemorrhagic shock and multiple organ injuries, can reach up to 60% [1, 4*] (Adam Starr, Joseph P. Minei, 2002)*. This high mortality is primarily linked to the anatomical characteristics of the pelvis, which houses major blood vessels, neural structures, and vital organs. Disruption of pelvic stability can lead to extensive internal bleeding, rapid hemodynamic deterioration, and death if not promptly managed.

Although pelvic fractures account for a relatively small proportion of the total trauma burden—approximately 16% according to epidemiological data [6, 16]—they are disproportionately represented in trauma-related morbidity and mortality. This is particularly true for unstable fractures involving the posterior pelvic ring, which are frequently associated with massive bleeding, pelvic hematoma formation, and visceral injuries [20].

Modern research in this field primarily focuses on optimizing emergency care protocols, surgical techniques, and rehabilitation strategies for patients with pelvic injuries [10, 15]. There is considerable progress in imaging diagnostics, damage control orthopedics, external and internal fixation methods, and intensive care for polytrauma patients. However, despite these advancements, a substantial gap remains in the epidemiological understanding of pelvic trauma. While many clinical studies describe treatment outcomes, relatively few publications offer a detailed epidemiological perspective, especially in low- and middle-income countries [9, 14].

Specifically, insufficient attention has been paid in the literature to such critical factors as age and sex distribution, mechanisms and circumstances of injury (e.g., road traffic accidents, falls, occupational trauma), and anatomical classification of fractures [3, 8, 16, 20]. These aspects are essential for developing targeted preventive strategies, organizing trauma care systems, and forecasting the resource needs of hospitals and emergency services.

In the Republic of Kazakhstan, the situation is further complicated by the absence of a unified national trauma registry. Such a registry would significantly facilitate data collection for retrospective and prospective epidemiological research. Currently, medical institutions operate using isolated databases and heterogeneous recording systems, which hinders comprehensive statistical analysis and the development of evidence-based clinical guidelines.

Moreover, regional differences in trauma mechanisms, demographic composition, and access to emergency care remain poorly studied. In many cities and rural areas, including those in East Kazakhstan, social and infrastructural factors—such as active construction, poor road conditions, seasonal climate risks, and insufficient public health education—may significantly influence trauma incidence and outcomes.

Given this context, the present study aims to fill part of the identified knowledge gap by conducting an epidemiological analysis of patients with pelvic bone injuries hospitalized at the Emergency Hospital of Semey, East Kazakhstan Region (Republic of Kazakhstan).

This research will examine key parameters such as patient age and sex, injury mechanisms, fracture classification according to the AO/Tile system, and seasonal trends.

The findings of this study may contribute to improving preventive measures, optimizing trauma care, and supporting the development of national epidemiological databases in Kazakhstan and other similar settings.

Materials and methods

This study is a descriptive retrospective analysis conducted within a single medical institution. The research was carried out as part of the grant-funded project supported by the Ministry of Education and Science of the Republic of Kazakhstan: IRN AP05135531, entitled "Development of a System of Ortho Surgical Rehabilitation of Pelvic Bone Injuries in Road Traffic Accidents in the Republic of Kazakhstan." The primary aim of the study was to evaluate the epidemiological characteristics, injury mechanisms, treatment methods, and outcomes associated with pelvic bone injuries in the given population, with a focus on informing the development of a standardized rehabilitation system.

The study design is cross-sectional and includes a complete dataset of all patients diagnosed and treated for pelvic injuries (N = 250) at the State Healthcare Institution of the Kazakhstan Republic "Semey City Emergency Hospital" over a five-year period, from January 1, 2013, to December 31, 2017. This facility serves as a tertiary referral center for trauma patients in the East Kazakhstan region, making it a suitable setting for the collection of comprehensive data on pelvic trauma.

The primary data source was standardized clinical documentation, specifically form No. 027/u "Extract from the medical record of an inpatient," which ensured the reliability and uniformity of the collected information. From each patient's record, the following variables were extracted and coded for analysis: demographic data (age, gender [male/female], race [Asian/European]); mechanism of injury (road traffic accident, motorcycle crash, fall from standing height, fall from a height of more than 1 meter, direct collision, industrial accident, assault, railway injury); and the location where the injury occurred (unknown, urban area, rural area, highway, private residence, or institutional/organizational setting).

Additionally, the temporal aspects of injury presentation were recorded, including the exact date of hospital admission, with categorization by day of the week and season of the year, to assess possible time-related trends in pelvic trauma occurrence. The anatomical location of the injury within the pelvic ring was documented (right, left, bilateral, or involving the symphysis), along with the nature of emergency intervention, if any (application of external fixation devices or absence of immediate intervention). Classification of pelvic fractures was performed according to the widely accepted Tile classification system (types A, B, and C), providing a standardized framework for assessing the severity and stability of injuries.

Treatment modalities were classified as surgical or non-surgical, and final clinical outcomes were categorized as either improvement or death at discharge. These outcome measures allowed for assessment of the effectiveness of the treatment protocols applied during the study period.

Inclusion criteria for the study were as follows:

- Patients of any age or gender with a confirmed diagnosis of pelvic injury.
- Hospitalization at the Semey City Emergency Hospital during the period from 01.01.2013 to 31.12.2017.
- Availability of complete and accessible medical documentation in the hospital's record system.

Exclusion criteria included:

- Patients with incomplete, illegible, or missing medical records.
- Pelvic injuries treated exclusively in outpatient settings or in medical institutions other than the study site.
- Repeat hospitalizations or recurrent pelvic injuries (only the first documented incident per patient was included to avoid duplication of data).

The critical level of significance (alpha) used for statistical hypothesis testing was set at 0.05 (5%). All statistical analyses and data processing were performed using the IBM SPSS Statistics software, version 23.0. Descriptive statistics, frequency distributions, and inferential statistical methods were employed to explore potential associations between variables, as well as to identify patterns and trends in injury types, treatment choices, and clinical outcomes.

Results

The study included the results of 250 victims with pelvic bone injuries who were treated in hospital at the State Emergency Hospital of the City of Semey for the period from 01.01.2013 to 31.12.2017.

46.8% (117 people) of the victims were men, 53.2% (133 people) were women.

The mean age of the victims at admission was 47.31 years, standard deviation of 19.28, p = 0.003.

The mean age of men at admission was 43.62 years (range 17-95), Me 42, Q_1 28, Q_3 57, standard deviation 17.046; while the mean age of women was 50.56 years (range 16-92), Me 51, Q_1 50, Q_3 66, standard deviation 20.579 (Fig. 1, 2).

Figure 1 shows the average age of the victims:

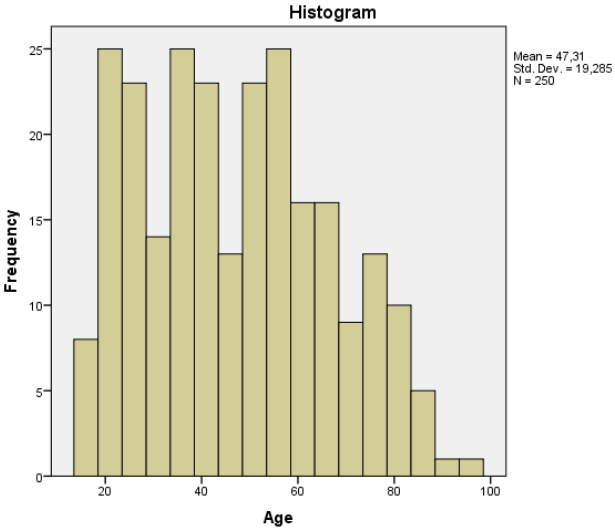

Figure 1. The average age of the victims.

Figure 2 shows the average age of the victims based on gender.

The mean length of hospitalization was 16.27 days. The standard deviation was 13.85. p = 0.000.

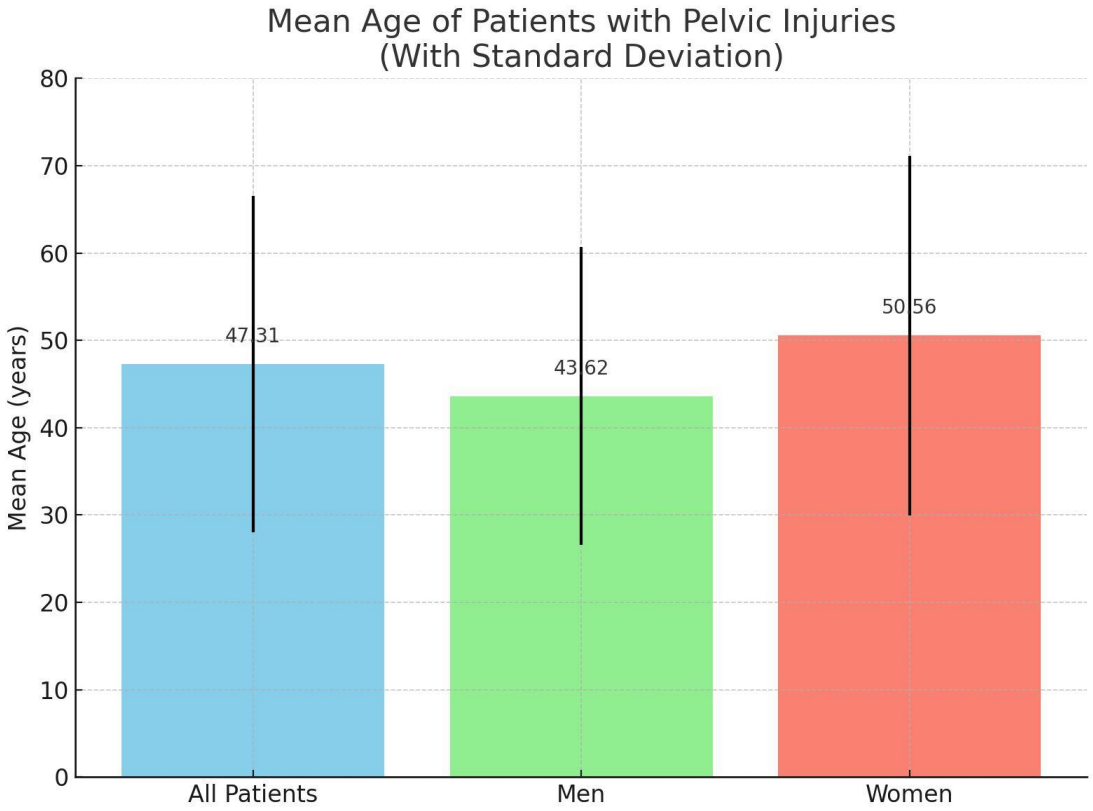

Figure 2. The average age of the victims.

The mean length of hospitalization for men at admission was 16.35 days (range 0-78), Me 14, Q1 7, Q3 21, SD 12.871, while the mean length of hospitalization for women was 16.20 (range 0-126), Me 12, Q1 7, Q3 21, SD 14.707. p = 0.000.

The age of women was significantly higher than the age of men at admission. p = 0.010.

The distribution of victims by nationality was as follows: Kazakhs made up most victims - 61.6% (154 people), Russians 30.4% (76 people), and other nationalities accounted for 8% (20 people).

During the year, cases of pelvic bone injuries were registered: 20.8% (N = 52) in spring, 24.4% (N = 61) in winter, 22.4% (N = 56) in summer and 32.4% (N = 81) in autumn.

Figure 3 shows the seasonable distribution of pelvic injury cases.

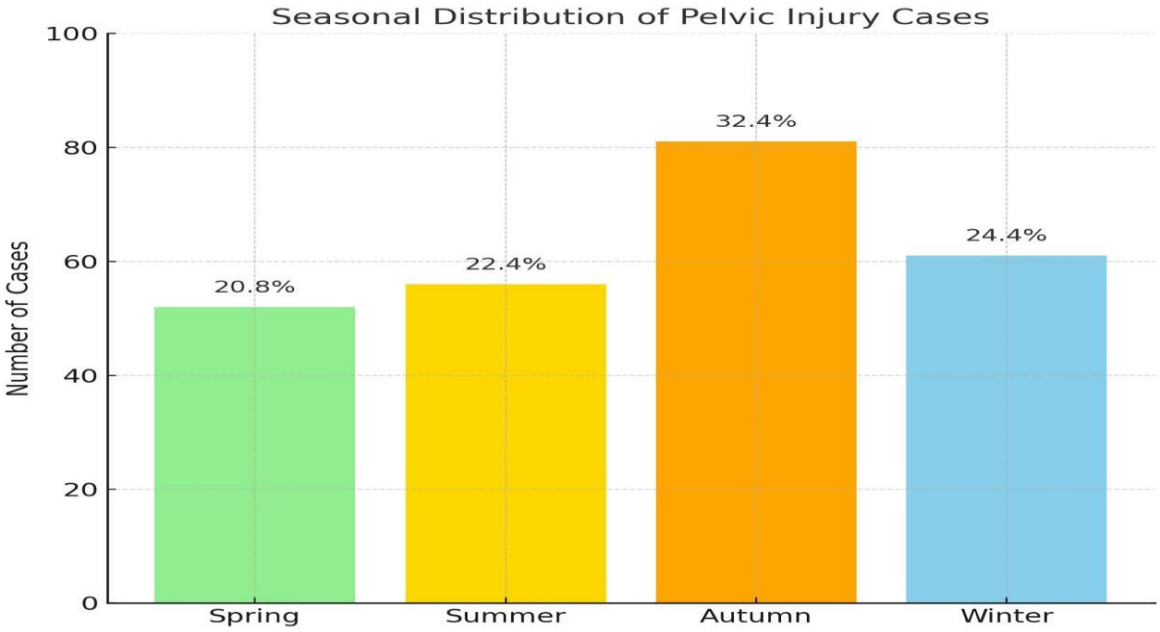

Figure 3. Seasonable distribution of pelvic injury cases.

Distribution of pelvic injuries by days of the week:

Table 1.

Distribution of pelvic injuries by days of the week.

Day of the week	Frequency	Percent/%
Monday	32	12.8
Tuesday	44	17.6
Wednesday	31	12.4
Thursday	36	14.4
Friday	36	14.4
Saturday	34	13.6
Sunday	37	14.8
Total	250	100,0

Distribution of injuries by the mechanism of receipt:

Table 2.

Distribution of injuries by mechanism of receipt.

Mechanism of injury	Frequency	Percent, %
Road accident	48	19.2
Fall from a motorcycle	2	,8
Street injury fell from own height	71	28.4
Fall from a height of 4 floors	64	25.6
Falling from a horse	3	1,2
Hit by a car	45	18.0
Fall at the ski resort	4	1.6
Industrial injury was trapped between the grate and the truck	13	5.2
Total	250	100,0

82.4% (206) of victims were injured in urban areas, 14.4% (36) in rural areas, and 3.2% (8) on highways.

Table 3.

Immobilization method.

Immobilization method used		Frequency	Percent, %
Valid	On a gurney	24 7	98, 8
	Bed with a shield	3	1,2
Total		250	100,0

Affected area of the pelvic ring:

Table 4.

Affected area.

	Frequency	Percent, %
Others (sacrum/coccyx)	87	34.8
both	81	32.4
symphysis	35	14.0
left	17	6.8
on the right	30	12.0
Total	250	100,0

Distribution of pelvic bone injuries according to the AO classification - Tile

Table 5.

Distribution of pelvic bone injuries according to the AO classification – Tile.

Classification by AO - Tile		Frequency	Percent, %
Valid	1	136	54.4
	2	103	41.2
	3	10	4.0
	C	1	.4
	Total	250	100.0

Figure 4 shows the distribution of pelvic bone injuries according to the AO classification – Tile.

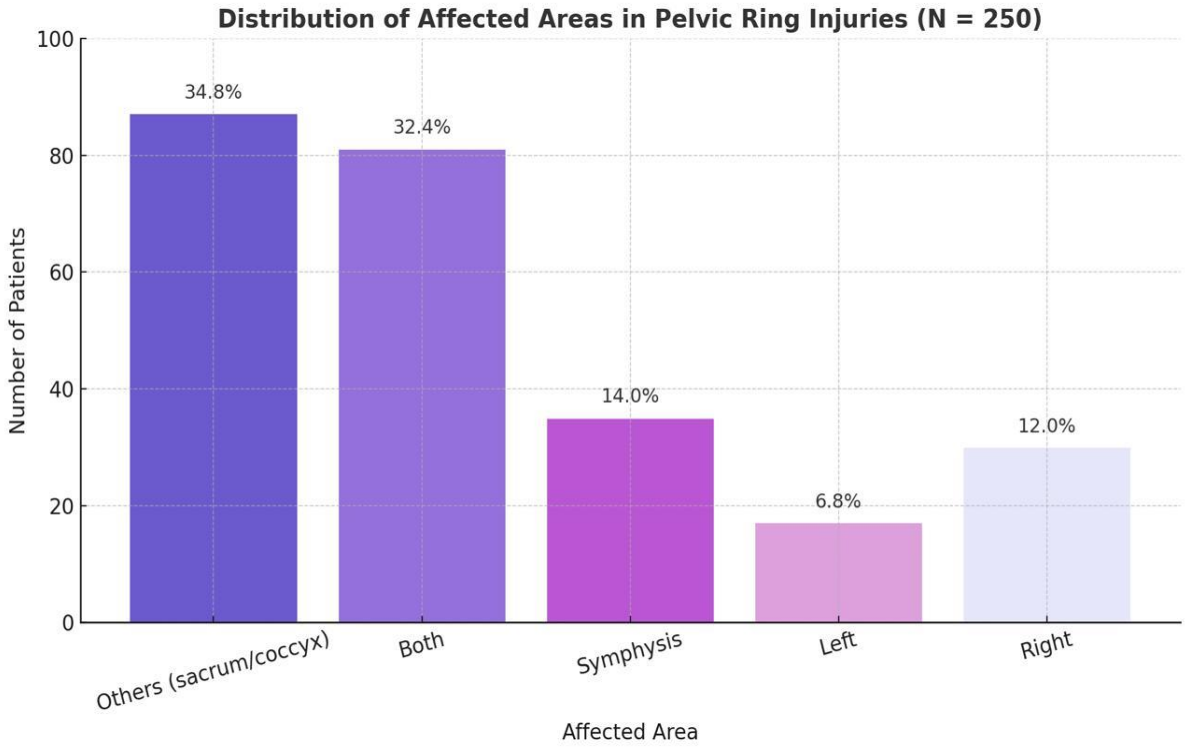

Figure 3. Distribution of pelvic bone injuries according to the AO classification – Tile.

Table 6.

Associated damage.

	Frequency	Percent, %
Isolated trauma	35	14.0
Multiple trauma	215	86.0
Combinations of skull and brain injury (concussion, brain contusion)	98	39.2
Combinations with abdominal injuries (rupture of the liver, spleen, intestines, kidneys, bladder).	2	0,8
Combinations with closed fractures of the upper limbs (shoulder, forearm, hand)	35	14.0
Concomitant pathology (diabetes mellitus, arterial hypertension, neurological pathology)	47	18.8
Combinations with chest injuries (pneumothorax, hemopneumothorax, rupture of the lung, trachea)	17	6.8
Combinations with spinal injuries	42	16.8
Combinations with open fractures of the lower extremities (thigh, shin, foot)	1	0.4
Combinations with closed fractures of the lower extremities (thigh, shin, foot)	48	19.2
Post-traumatic neuritis of the sciatic nerve.	2	0.8

93.2% (N =233) of victims did not require surgical treatment, and 6.8% (N =17) were treated surgically. 97.2% (N = 243) of the victims were discharged, and 2.8% (N = 7) were fatal.

Discussion of results

As a result of the retrospective cross-sectional study conducted in the city of Semey, we determined that the mean age of patients with pelvic bone fractures was 47.31 years (standard deviation – 1.9, minimum – 28). This figure is slightly higher than the findings reported in similar studies by other authors [5, 9, 13, 19]. Such a discrepancy in average age may be attributed to the unique demographic characteristics of Semey. In recent decades, the city has experienced a gradual outmigration of younger individuals to major urban centers such as Astana and Almaty in pursuit of employment, education, and better quality of life. This demographic trend contributes to an aging population base, particularly among the socially and economically disadvantaged groups, potentially leading to a higher average age among trauma patients, including those with pelvic fractures.

In our sample, the majority of patients were of Asian descent, which reflects the overall ethnic composition of the Republic of Kazakhstan, where the indigenous population is predominantly Kazakh and thus of Asian origin. Understanding this demographic factor is essential when evaluating the epidemiology of trauma in the region. It may also influence genetic, physiological, and behavioral risk factors associated with bone fragility and injury susceptibility.

Regarding sex distribution, men constituted 53.2% (N=133) of all pelvic fracture cases. Although this finding supports previous regional data, it contrasts with several international epidemiological studies where the incidence of pelvic fractures among women, especially those over 60 years of age, is significantly higher—up to 5.82 per 10,000 people [14, 18, 21], compared to 2.73 per 10,000 in men [14]. This global pattern is typically associated with postmenopausal osteoporosis and increased fall risk among elderly women. However, in Semey, the predominance of men may reflect local factors such as higher male participation in high-risk occupations (e.g., construction, manual labor), greater exposure to road traffic, and increased rates of trauma-related incidents among men due to lifestyle and occupational hazards.

Seasonal analysis revealed that the highest number of pelvic injuries occurred during the autumn months, accounting for 32.4% (N=81) of all recorded cases. This seasonal trend aligns with the findings from other climatic regions where slippery surfaces due to rain, wet foliage, or early frost significantly increase the risk of falls and accidents, particularly among older adults and those with mobility impairments. In addition to environmental conditions, autumn is a period of heightened physical activity, especially in rural areas. Activities related to harvesting, construction, and winter preparation, such as roof repairs, wood chopping, and property maintenance, significantly increase the likelihood of traumatic injuries. These behavioral patterns must be accounted for in local injury preven.

Analysis of injury distribution by day of the week revealed a peak in incidence on Tuesdays (17.6% of cases). Although this finding may seem anecdotal, it corresponds with previous research we conducted in Nur-Sultan and may suggest patterns in weekly work cycles, commuting routines, or healthcare access behavior that warrant further investigation.

With regard to injury mechanisms, falls from a height of more than 1 meter were the most common cause (25.6%), followed by falls from standing height (28.4%), road traffic accidents (19.2%), and pedestrian collisions (18%). The high proportion of fall-related injuries in Semey indicates a need to address both occupational safety (in construction and industrial settings) and mental health concerns, as psychological distress and suicidality are often linked to intentional falls from height. These findings highlight an urgent need for community-level interventions, particularly in urban environments experiencing rapid construction growth and economic transition.

Our findings contrast with international studies where road traffic accidents (RTAs) account for up to 59% of pelvic injuries and are often associated with a high risk of polytrauma and mortality [8, 16]. In our cohort, RTAs accounted for a relatively smaller portion of cases. This divergence may reflect differences in road safety policies,

urban planning, traffic density, or reporting practices. However, it does not diminish the critical importance of traffic safety initiatives in Kazakhstan, where vehicle and pedestrian interactions continue to be a significant source of trauma-related morbidity.

Falls from a height greater than 1 meter accounted for a substantially higher proportion of injuries in our study compared to international figures, where such cases typically represent around 6% of pelvic fractures [7]. We attribute this to two key factors: (1) active construction and inadequate safety protocols in the local labor market, and (2) a high prevalence of psychosocial stress and psychiatric illness, including suicidality, in the Semey population. Both factors require public health attention and multidisciplinary policy responses, combining occupational safety regulations with accessible mental health services.

According to the AO/Tile classification system, type A fractures (stable injuries) were the most common, comprising 54.4% of cases, followed by type B (partially stable injuries with rotational instability) at 41.2%, and type C (completely unstable injuries) at 4.4%. These data are consistent with previous epidemiological studies indicating that type A injuries are more prevalent in low-energy trauma, such as falls, while types B and C are more frequently associated with high-energy impacts, such as RTAs and industrial accidents [3, 15].

The observed seasonal distribution of pelvic injuries further underscores the importance of incorporating season-specific strategies into injury prevention programs. For example, autumn-targeted public awareness campaigns focusing on fall prevention, proper use of safety equipment, and safe work practices could reduce injury rates. Infrastructure improvements such as anti-slip sidewalk coatings, proper street lighting, and accessible emergency services may also play a pivotal role in preventing injuries, particularly among the elderly and physically vulnerable populations.

Moreover, preventive strategies should include road safety education for both drivers and pedestrians, stricter enforcement of traffic laws, and urban infrastructure planning that accounts for safe pedestrian zones and traffic calming measures. These interventions are especially pertinent in urban centers like Semey, where a mix of industrial activity, residential construction, and high pedestrian traffic contribute to a complex trauma landscape.

Mental health services must also be prioritized, given the potential link between psychiatric disorders and falls from height. Early identification and support for individuals at risk of suicide or self-harm could not only save lives but also reduce the burden of trauma care on the healthcare system.

Conclusions

The study found that the average age of patients with pelvic bone fractures in Semey is higher than in other populations studied, which is due to the outflow of young people to large cities. The predominance of Asian victims is explained by the dominance of the indigenous population of Kazakhstan.

The main causes of pelvic injuries are road traffic accidents and falls from height, which highlight the need to improve compliance with traffic rules. It was also found that active construction and the high suicide rate in Semey contribute to the increase in the frequency of falls from a height of more than 1 meter.

The distribution of injuries according to the AO-Tile classification showed a predominance of type A (54.4%) and type B (41.2%). The limited number of cases did not allow us to identify a relationship between pelvic injuries and mortality, as observed in foreign studies.

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Author Contributions:

Elnara I. Efendiyeva *– contributed substantially to the conception and design of the study; conducted data collection and statistical analysis; interpreted the results; drafted and finalized the manuscript; ensured adherence to academic and ethical standards throughout the research process.*

Yersin T. Zhunusov *– provided expert clinical consultation in the field of traumatology and orthopedics; supervised medical data verification and classification; contributed to the critical revision of the manuscript for important intellectual content.*

Assylzhan M. Mesova *– assisted in organizing patient records and supporting documentation; participated in the formatting and preparation of the manuscript for submission; conducted literature search on epidemiological aspects of pelvic trauma.*

Zhamal D. Zhaparova *– supported data extraction from primary sources and helped tabulate the clinical parameters; contributed to drafting sections of the methods and discussion under supervision.*

Aidos S. Tlemisov *– provided expert insight into the rehabilitation aspects of pelvic injuries; contributed to the contextualization of the results within the healthcare system of the Abai region; reviewed the final manuscript for alignment with clinical rehabilitation practices.*

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