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Research hotspots for pediatric fractures from 2017 to 2022: A bibliometric and visual analysis via Citespace

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Abstract

Objective: This review provides guidance and ideas for researchers through a comprehensive and comparative analysis of the present state, trends, and hotspots in the pediatric fracture literature over the past 6 years.

Methods: We used Citespace 6.1.R6 software to explore the country/region distribution, institutions, journals, keyword analysis, and co-cited references of the literature from Web of Science core database.

Results: There are 6472 pieces of pediatric fracture–related literature, including 2962 from 2017 to 2019 and 3510 from 2020 to 2022. The country with the most papers is the United States, and US institutions and journals also have a pivotal position in this field. Research hotspots for pediatric fractures in 2017–2019: The topic with the most attention is bone mineral density leading to related bone diseases. Treatment for pediatric fractures, including supracondylar humeral fractures, Monteggia fractures, forearm fractures, knee fractures, and ankle fractures in children, is another topic of greater interest. Brain injuries and dental injuries in children due to abuse and trauma are also concerning issues. Research hotspots for pediatric fractures in 2020–2022: comparison with 2017–2019 revealed a relative decrease regarding ankle-related epiphyseal injuries, but there is a higher focus on the epidemiology of fractures in children, risk factors, and reasons for childhood trauma. We have confirmed through literature co-citations that the literature of high interest is also in these aspects.

Conclusion: Researchers and clinicians can quickly learn about topics of interest through authoritative journals and highly cited literature and rapidly master the current status and frontiers of the field through study, providing ideas for future work.

Keywords: Children, fractures, Citespace, bibliometrics, visualization

Introduction

With the novel coronavirus pneumonia (COVID-19) pandemic,[1] the government has taken steps to control the outbreak through home isolation, teleconsultation, and vaccination.[2–4] The rapid spread of COVID-19 has changed people's lifestyles to some extent, and people are spending more time at home, leading to changes in trauma from various causes,[5,6] which has attracted extensive attention from researchers. A statistical and mathematical method named bibliometrics is designed to quantify the influence and features of the literature.[7,8] A bibliometric approach has been broadly used in the orthopedic field, for example, in proximal femur fractures,[9] scoliosis,[10] developmental dysplasia of the hip,[11] and osteoporosis.[12] This study analyzed the overall literature data related to pediatric fractures for the 2017–2022 period by bibliometric analysis using software, such as Citespace 6.1.R6, comparing and analyzing pediatric fracture data for the first and

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last 3 years. Through our review, we provide accurate references and guidance for researchers related to pediatric fractures by summarizing the present status, hotspots, and frontier topics in the field.

Materials and methods

This review retrieves data on pediatric fractures from 2017 to 2022 through the Web of Science (WOS) core database. The purpose of this study was twofold: (1) to provide information about the pediatric fracture literature in the last 6 years and (2) to compare and analyze the pediatric fracture literature in the first and last 3 years. (1) Search parameters: #1. TS = "Children" or "Child" or "Pediatric" or "Teenager" or "Adolescent" or "Juvenile"; #2. TS = "Fracture." (2) Document types: Article and Review Article. (3) Time span: January 1, 2017–December 31, 2022. (4) Languages: English. Retrieve all pediatric fracture data from 2017 to 2022 by #1 and #2 and publication date; retrieve all pediatric fracture data from 2017 to 2019 by #1 and #2 and publication date; retrieve all pediatric fracture data from 2020 to 2022 by #1 and #2 and publication date. The first author completed the data search within one day on January 30, 2023, to prevent data changes caused by database updates. We processed and analyzed the data using Citespace 6.1.R6 software and the bibliometric online analysis platform.

Inclusion and exclusion criteria

Inclusion criteria. (1) Search parameters: #1. TS = "Children" or "Child" or "Pediatric" or "Teenager" or "Adolescent" or "Juvenile"; #2. TS = "Fracture." (2) Document types: Article and Review Article. (3) Time span: January 1, 2017–December 31, 2022. (4) Languages: English.

Exclusion criteria. (1) Document types: Letter and Meeting Abstract, etc. (2) The literature has not studied fractures in children. (3) Languages: non-English. (4) Removal of duplicate literature.

Results

A total of 6472 eligible articles related to pediatric fractures between 2017 and 2022 were searched through the WOS, with 2962 from 2017 to 2019 and 3510 from 2020 to 2022. The number of articles on pediatric fractures over these 6 years showed an increasing form with 915, 990, 1057, 1124, 1179, and 1207 articles published from 2017 to 2022, respectively.

Country/region distribution

The WOS contains articles on pediatric fractures from no less than 121 countries and territories. The United States is the most published article country with the highest H-index at 48. Table 1 lists the top 20 countries based on

Table 1. WOS core database 2017–2022 country publication volume top 20 on pediatric fracture.

Rank	Country	Total	Percentage (N/6472) (%)	H-index	ACI
1	USA	2553	39.45	48	8.14
2	China	715	11.05	21	4.15
3	England	486	7.51	30	14.01
4	Canada	344	5.32	31	12.08
5	Germany	280	4.33	23	14.05
6	Italy	264	4.08	25	12.36
7	Turkey	262	4.05	14	3.88
8	France	260	4.02	20	6.68
9	Australia	249	3.85	24	14.42
10	Japan	198	3.06	14	5.18
11	India	162	2.50	12	4.37
12	South Korea	152	2.35	11	6.13
13	Switzerland	151	2.33	17	21.34
14	The Netherlands	136	2.10	17	24.92
15	Brazil	135	2.09	15	7.57
16	Spain	126	1.95	16	10.29
17	Sweden	119	1.84	19	13.86
18	Finland	100	1.55	14	24.63
19	Israel	98	1.51	11	6.8
20	Austria	87	1.34	15	9.29

ACI: average citation per item.

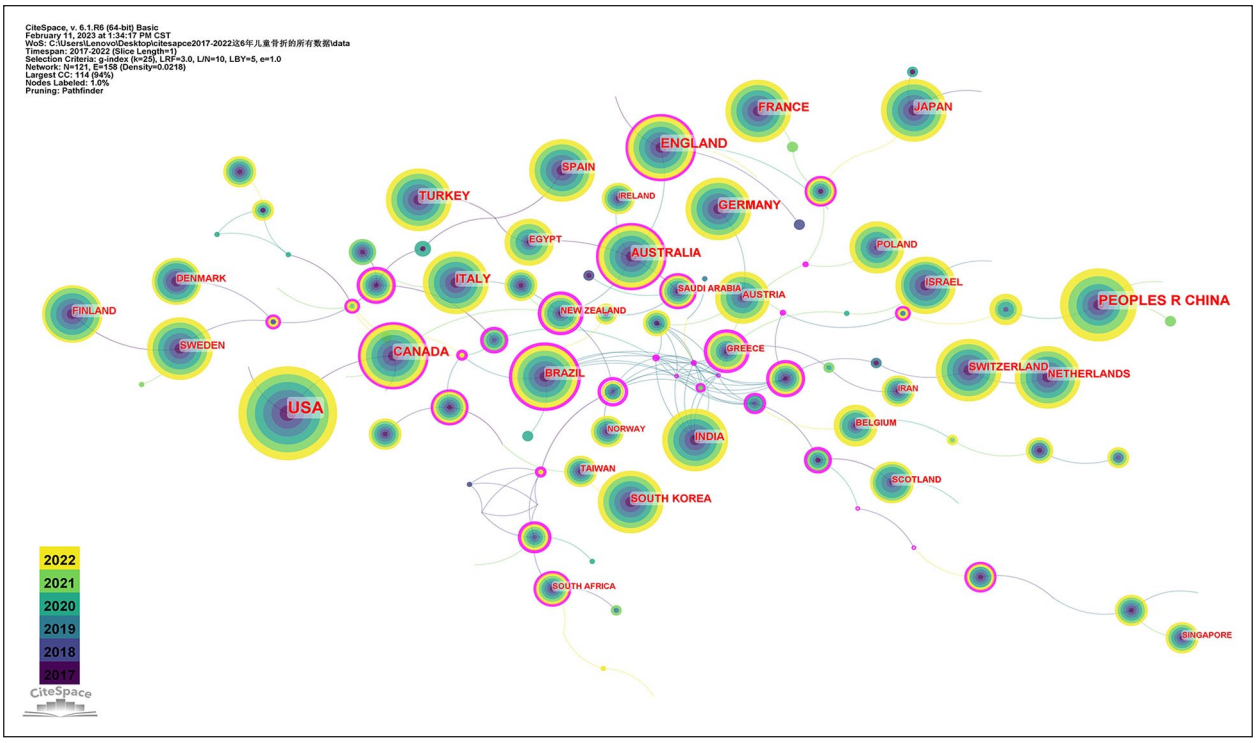


Figure 1. WOS core database 2017–2022 map of collaborative relationships between countries in the literature on pediatric fractures. The purple outer circle represents a high level of centrality.

publications, H-index, and average citations per item. Figure 1 finds a higher number of articles from Europe and the United States, while the contribution of China in this field is prominent by a visual analysis of cooperative relationships between countries.

Institutional distribution

A total of 415 organizations participated in this study on pediatric fractures during these 6 years, plotting the inter-institutional collaborative relationships (Figure 2), with the labels in Figure 2 giving those that published more than 40 articles. Many top-ranked organizations are from the United States; for example, the Children's Hospital of Philadelphia, Harvard Medical School, and the University of Pennsylvania in the United States have more studies in this field.

Journal influence

Using the bibliometric online analysis platform, we analyzed the journal impact of the published literature regarding pediatric fractures during these 6 years. This literature was published in a total of 1232 journals, listing the 10 journals with the highest overall citation counts, with seven of these publishers located in United States and three others in the United Kingdom (Table 2). The top-ranked journal was the Journal of Pediatric Orthopedics. The journal had an H-index of 84 and the highest overall citation count.

Keyword analysis

Keywords can, to a certain extent, represent the main study content of a piece of literature. The keywords were clustered using the log-likelihood ratio test method (LLR) in the Citespace 6.1.R6 software. The whole keyword network is divided into several different clusters by cluster analysis, where keywords within the same cluster set have similarities. Specifically, the modularity value (Q-value) and the weighted mean silhouette (S-value) are two crucial indicators for determining the relevance of the cluster. A Q-value above 0.3 and an S-value above 0.7 indicate a significant cluster. Keyword analysis related to pediatric fracture data from 2017 to 2019: the top 10 keywords after removing keywords with search terms are risk, injury, management, bone mineral density, epidemiology, fixation, complication, osteoporosis, osteogenesis imperfecta, and diagnosis. The keywords were further clustered and analyzed, and there were 21 clusters (Table 3), with the top 10 clusters as shown in Figure 3. The results showed an S-value of 0.8945, reflecting that the network was reasonable. The results showed an S-value of 0.9487, indicating good homogeneity of clusters. Keyword analysis related to pediatric fracture data from 2020 to 2022: the top 10 keywords after removing keywords with search terms are

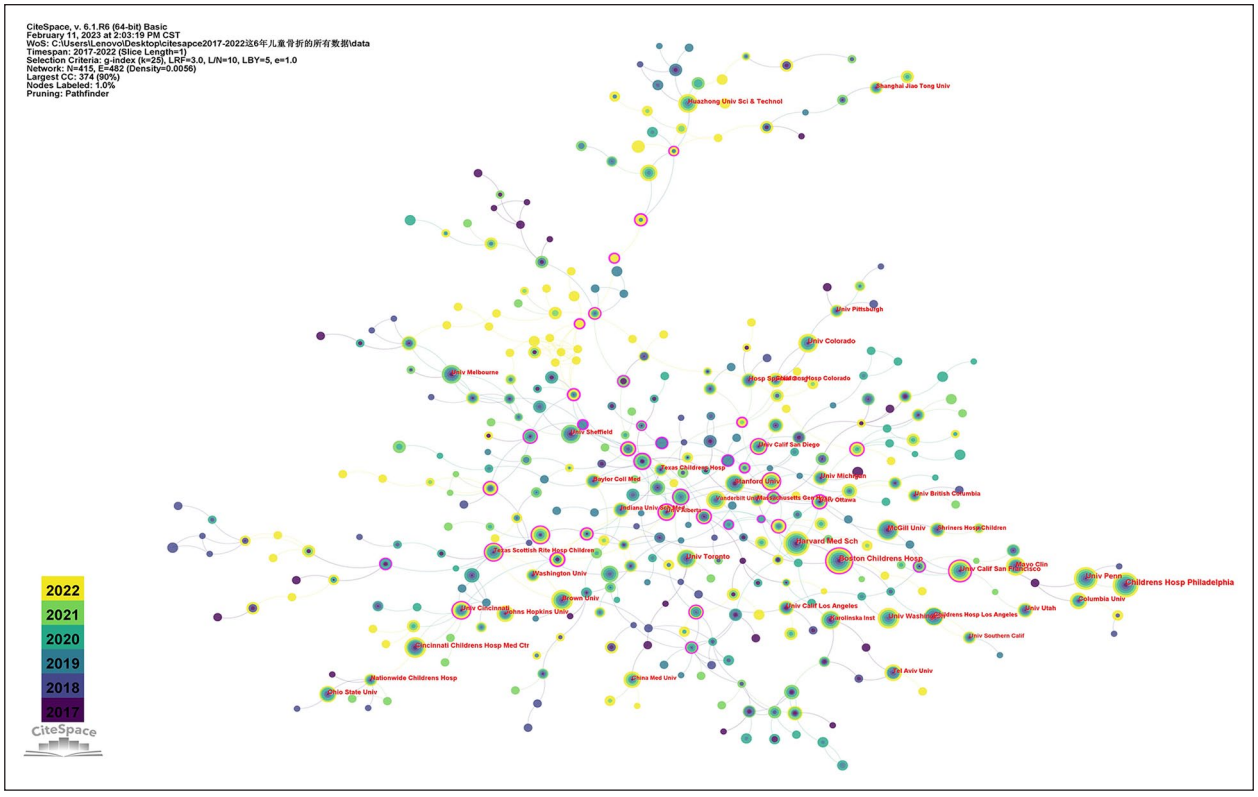


Figure 2. WOS core database 2017–2022 map of inter-institutional collaborations in the literature on pediatric fractures. Differently colored line segments represent the year of the first cooperation between different institutions; differently colored nodes represent the year of the first issuance by the different institutions. The purple outer circle represents a high level of centrality.

Table 2. Top 10 most-cited journals about pediatric fracture patients overall in the WOS from 2017 to 2022.

Rank	Journal	Total	Overall citation count	Average number of citations per article	Country	Impact factor
1	*Journal of Pediatric Orthopedics*	402	1098	2.73	USA	2.537
2	*Bone*	125	317	2.54	USA	4.624
3	*Journal of Bone and Mineral Research*	78	301	3.86	USA	6.390
4	*Journal of Pediatric orthopedics-Part B*	186	249	1.34	USA	1.473
5	*Journal of Children's Orthopedics*	105	235	2.24	UK	1.917
6	*Medicine*	131	187	1.43	USA	1.817
7	*Injury-International Journal of the Care of the Injured*	112	180	1.61	UK	2.687
8	*Osteoporosis International*	66	176	2.67	UK	5.071
9	*Pediatric Radiology*	88	173	1.97	USA	3.005
10	*Pediatric Emergency Care*	160	162	1.01	USA	1.602

WOS: Web of Science.

management, injury, risk, bone mineral density, epidemiology, fixation, complication, diagnosis, outcome, and prevalence. The keywords were further clustered and analyzed, and there were 20 clusters (Table 4), with the top 10 clusters shown in Figure 4. The results showed an S-value of 0.8807, reflecting that the network was reasonable. The results showed an S-value of 0.9376, indicating good homogeneity of clusters.

Co-citation of references

Analysis of references and co-citations is an effective way to guide any research field and track the frontiers of development.[13] We used this feature to list the top 30 references with the strongest citation bursts (Figure 5). This is another way to identify research trends by analyzing co-citations in the references. We can visually observe the focus and

Table 3. WOS core database 2017–2019 keyword clustering summary about the pediatric fracture.

Cluster	Size	Silhouette	Year	Clustered tag words
#0	36	0.957	2017	mineral density; anorexia nervosa; girl; osteoporosis; microarchitecture
#1	36	0.978	2017	closed reduction; supracondylar humeral fractures; supracondylar humerus fracture; open reduction; Monteggia fracture
#2	35	0.888	2017	dual-energy x-ray absorptiometry; ulnar osteotomy; radial head dislocation; body composition; lean mass
#3	30	0.968	2017	knee; anterior cruciate ligament; tibial eminence fracture; intercondylar eminence; reconstruction
#4	29	0.949	2017	avascular necrosis; acute lymphoblastic leukemia; osteonecrosis; lateral condyle fracture; delayed union
#5	28	0.968	2017	low back pain; stress fracture; proximal junctional kyphosis; overuse injury
#6	27	0.902	2017	osteogenesis imperfecta; facial fracture; pattern; road traffic accidents; arthritis
#7	27	0.891	2018	hypophosphatasia; alkaline phosphatase; osteogenesis imperfecta; asfotase alfa; bisphosphonate
#8	27	0.944	2017	distal radius; redisplacement; forearm fracture; decision rule; buckle fracture
#9	25	0.932	2017	clavicle; body mass index; outcome; elastic stable intramedullary nailing; shoulder
#10	24	0.961	2017	dental trauma; permanent teeth; traumatic dental injuries; quality of life; tooth injuries
#11	24	0.949	2017	traumatic brain injury; abusive head trauma; supracondylar fracture; pediatric trauma; brain injury
#12	22	1	2017	physeal fracture; ankle fractures; magnetic resonance imaging; growth arrest; ankle
#13	22	0.959	2017	child abuse; skeletal survey; computed tomography; non-accidental trauma; rib fracture
#14	22	0.934	2017	analgesia; emergency department; pediatric emergency department; united states; pain
#15	21	1	2017	titanium elastic nail; femur fracture; radial neck fracture; functional outcome; spica cast
#16	21	0.96	2017	young adult; cerebral palsy; bone density; birth weight infant; proton pump inhibitor
#17	21	0.948	2017	vitamin d; bone mineral density; parathyroid hormone; osteoporosis; duchenne muscular dystrophy
#18	19	0.934	2017	avulsion fracture; osteogenesis imperfecta; phenotype; tibial tubercle; lesser trochanter
#19	16	0.951	2017	management; physical activity; children; epidemiology; fracture
#20	11	1	2017	distal radius fracture; ultrasonography; ultrasound; point-of-care ultrasound; bone mineral density

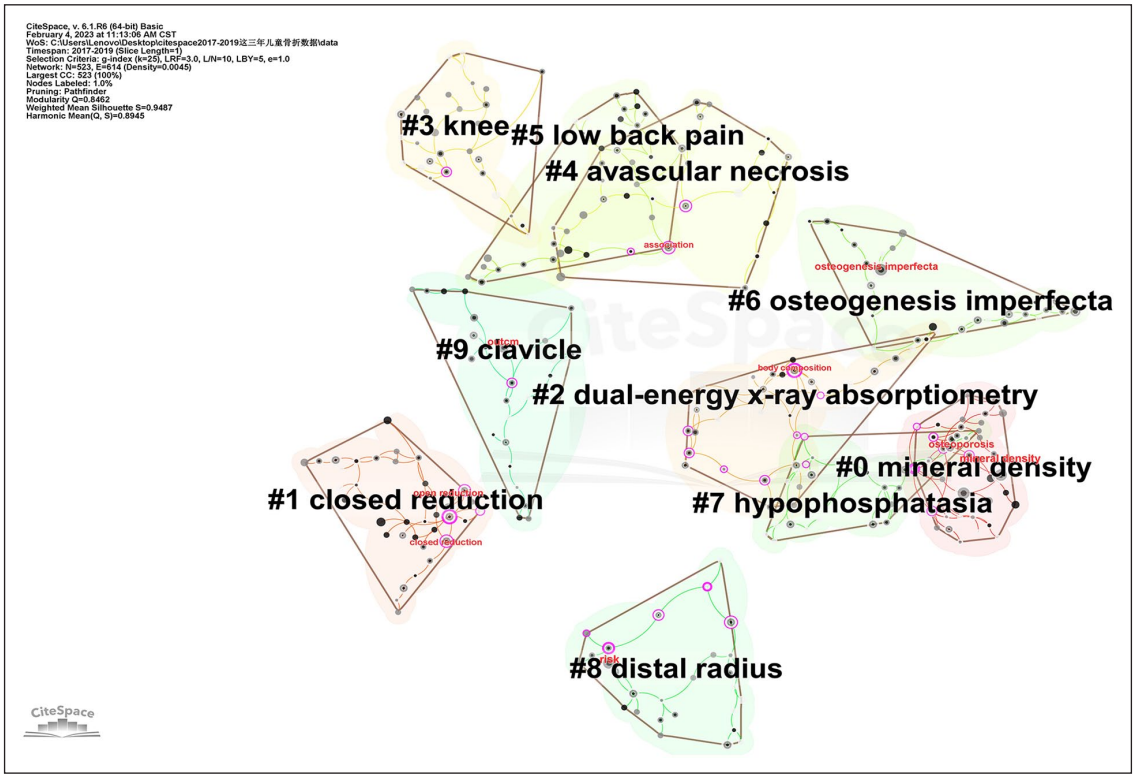


Figure 3. WOS core database for keyword clustering of relevant literature on pediatric fractures from 2017 to 2019.
The red font represents keywords with high frequency. The black font represents clustering labels. The purple circles represent high centrality.

Table 4. WOS core database 2020–2022 keyword clustering summary about the pediatric fracture.

Cluster	Size	Silhouette	Year	Clustered tag words
#0	36	0.961	2020	bone mineral density; osteoporosis; body composition; bone density; obesity
#1	33	0.936	2020	anterior cruciate ligament; knee; tibial eminence fracture; tibial spine fracture; tibial spine
#2	32	0.951	2020	vitamin d; vitamin d deficiency; calcium; epilepsy; type 1
#3	31	0.96	2020	computed tomography; traumatic brain injury; magnetic resonance imaging; ultrasonography; pulled elbow
#4	30	0.877	2020	dental trauma; abusive head trauma; brain injury; maxillofacial trauma; shaken baby syndrome
#5	30	0.967	2020	supracondylar humerus fracture; open reduction; closed reduction; supracondylar humerus fractures; internal fixation
#6	30	0.977	2020	osteogenesis imperfecta; machine learning; mutation; musculoskeletal ultrasound; disease
#7	29	0.931	2020	osteogenesis imperfecta; bisphosphonate; systematic review; duchenne muscular dystrophy; bone health
#8	29	0.91	2020	stress fracture; obesity; pathological fracture; unicameral bone cyst; spondylolysis
#9	28	0.951	2020	forearm fracture; distal radius fracture; conservative treatment; radius fracture; forearm fractures
#10	28	0.981	2020	anorexia nervosa; tooth fracture; traumatic dental injuries; turner syndrome; estrogen
#11	25	0.924	2020	clavicle fracture; type 1 diabetes; expression; physical activity; exercise
#12	25	0.967	2020	epidemiology; children; fracture; trauma; risk
#13	24	0.857	2020	titanium elastic nail; elastic stable intramedullary nailing; flexible intramedullary nail; fixation; elastic stable intramedullary nail
#14	23	0.944	2020	cubitus varus; skull fracture; head trauma; head injury; skull fractures
#15	22	1	2020	avascular necrosis; femoral neck fracture; case report; osteonecrosis; bone mineral density
#16	21	0.947	2020	child abuse; skeletal survey; physical abuse; non-accidental trauma; infants
#17	20	0.983	2021	analgesia; emergency department; pain management; race; care
#18	20	0.94	2021	replacement; external fixation; limb salvage; osteosarcoma; tumor endoprosthese
#19	11	0.964	2020	pediatric trauma; plate; removal; mechanical property; osteosynthesis

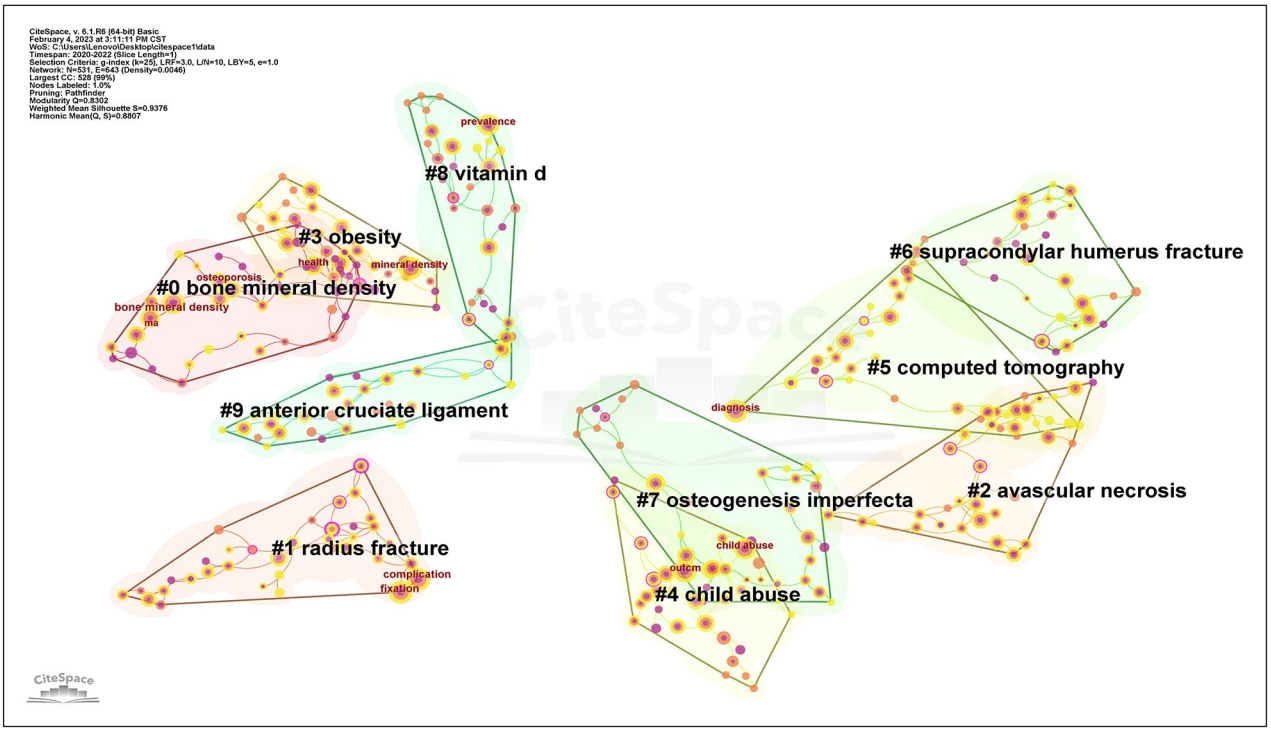
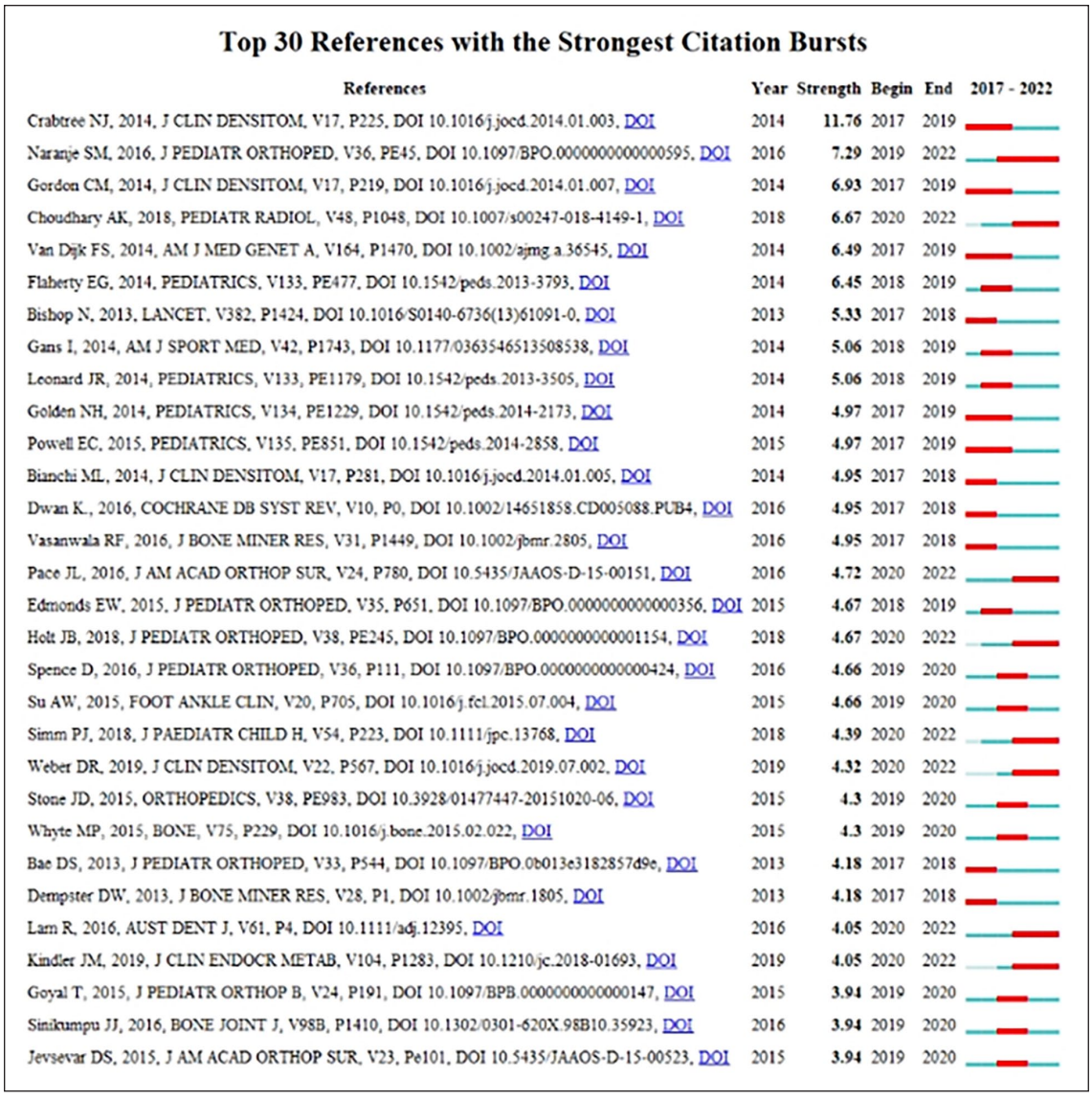


Figure 4. WOS core database for keyword clustering of relevant literature on pediatric fractures from 2020 to 2022.
The red font represents keywords with high frequency. The black font represents clustering labels. The purple circles represent high centrality.



Top 30 References with the Strongest Citation Bursts

References	Year	Strength	Begin	End	2017 - 2022
Crabtree NJ, 2014, J CLIN DENSITOM, V17, P225, DOI 10.1016/j.jocd.2014.01.003, DOI	2014	11.76	2017	2019	
Naranje SM, 2016, J PEDIATR ORTHOPED, V36, PE45, DOI 10.1097/BPO.0000000000000595, DOI	2016	7.29	2019	2022	
Gordon CM, 2014, J CLIN DENSITOM, V17, P219, DOI 10.1016/j.jocd.2014.01.007, DOI	2014	6.93	2017	2019	
Choudhary AK, 2018, PEDIATR RADIOL, V48, P1048, DOI 10.1007/s00247-018-4149-1, DOI	2018	6.67	2020	2022	
Van Dijk FS, 2014, AM J MED GENET A, V164, P1470, DOI 10.1002/ajmg.a.36545, DOI	2014	6.49	2017	2019	
Flaherty EG, 2014, PEDIATRICS, V133, PE477, DOI 10.1542/peds.2013-3793, DOI	2014	6.45	2018	2019	
Bishop N, 2013, LANCET, V382, P1424, DOI 10.1016/S0140-6736(13)61091-0, DOI	2013	5.33	2017	2018	
Gans I, 2014, AM J SPORT MED, V42, P1743, DOI 10.1177/0363546513508538, DOI	2014	5.06	2018	2019	
Leonard JR, 2014, PEDIATRICS, V133, PE1179, DOI 10.1542/peds.2013-3505, DOI	2014	5.06	2018	2019	
Golden NH, 2014, PEDIATRICS, V134, PE1229, DOI 10.1542/peds.2014-2173, DOI	2014	4.97	2017	2019	
Powell EC, 2015, PEDIATRICS, V135, PE851, DOI 10.1542/peds.2014-2858, DOI	2015	4.97	2017	2019	
Bianchi ML, 2014, J CLIN DENSITOM, V17, P281, DOI 10.1016/j.jocd.2014.01.005, DOI	2014	4.95	2017	2018	
Dwan K., 2016, COCHRANE DB SYST REV, V10, P0, DOI 10.1002/14651858.CD005088.PUB4, DOI	2016	4.95	2017	2018	
Vasanwala RF, 2016, J BONE MINER RES, V31, P1449, DOI 10.1002/jbmr.2805, DOI	2016	4.95	2017	2018	
Pace JL, 2016, J AM ACAD ORTHOP SUR, V24, P780, DOI 10.5435/JAAOS-D-15-00151, DOI	2016	4.72	2020	2022	
Edmonds EW, 2015, J PEDIATR ORTHOPED, V35, P651, DOI 10.1097/BPO.0000000000000356, DOI	2015	4.67	2018	2019	
Holt JB, 2018, J PEDIATR ORTHOPED, V38, PE245, DOI 10.1097/BPO.0000000000001154, DOI	2018	4.67	2020	2022	
Spence D, 2016, J PEDIATR ORTHOPED, V36, P111, DOI 10.1097/BPO.0000000000000424, DOI	2016	4.66	2019	2020	
Su AW, 2015, FOOT ANKLE CLIN, V20, P705, DOI 10.1016/j.fcl.2015.07.004, DOI	2015	4.66	2019	2020	
Simm PJ, 2018, J PAEDIATR CHILD H, V54, P223, DOI 10.1111/jpc.13768, DOI	2018	4.39	2020	2022	
Weber DR, 2019, J CLIN DENSITOM, V22, P567, DOI 10.1016/j.jocd.2019.07.002, DOI	2019	4.32	2020	2022	
Stone JD, 2015, ORTHOPEDICS, V38, PE983, DOI 10.3928/01477447-20151020-06, DOI	2015	4.3	2019	2020	
Whyte MP, 2015, BONE, V75, P229, DOI 10.1016/j.bone.2015.02.022, DOI	2015	4.3	2019	2020	
Bae DS, 2013, J PEDIATR ORTHOPED, V33, P544, DOI 10.1097/BPO.0b013e3182857d9e, DOI	2013	4.18	2017	2018	
Dempster DW, 2013, J BONE MINER RES, V28, P1, DOI 10.1002/jbmr.1805, DOI	2013	4.18	2017	2018	
Lam R, 2016, AUST DENT J, V61, P4, DOI 10.1111/adj.12395, DOI	2016	4.05	2020	2022	
Kindler JM, 2019, J CLIN ENDOCR METAB, V104, P1283, DOI 10.1210/jc.2018-01693, DOI	2019	4.05	2020	2022	
Goyal T, 2015, J PEDIATR ORTHOP B, V24, P191, DOI 10.1097/BPB.0000000000000147, DOI	2015	3.94	2019	2020	
Sinikumpu JJ, 2016, BONE JOINT J, V98B, P1410, DOI 10.1302/0301-620X.98B10.35923, DOI	2016	3.94	2019	2020	
Jevsevar DS, 2015, J AM ACAD ORTHOP SUR, V23, Pe101, DOI 10.5435/JAAOS-D-15-00523, DOI	2015	3.94	2019	2020	

Figure 5. WOS database top 30 in terms of total citation burst strength of references on pediatric fractures from 2017 to 2022. The red part shows the strongest burst of citations in this period.

evolution of interest in the pediatric fracture field. This high-interest literature will give a rapid understanding of this field and attract attention, which will dramatically help future research.

Discussion

We analyze mainly country, institution, keyword, keyword clustering, and co-citation references using Citespace 6.1.R6 software. The analysis of journal impact used the literature online analysis platform. We searched the literature regarding pediatric fracture studies in WOS and presented it in the context of visualization and a network knowledge graph.

The United States ranked first in published papers with the highest H-index at 48. The H-index is an important indicator for assessing the publications of a country, institution, or journal.[14] In general, the average citation per item (ACI) is another important parameter to evaluate the quality of a piece of literature. The Netherlands and Finland have a few publications but a relatively high ACI. The top-ranked scientific institutions are situated predominately in the United States, and the journals that have been the focus of attention in this field are predominantly from the United States and the United Kingdom and provide some direction for those who want to learn more about this field.

Keyword network maps are drawn up to determine the focus and hot topics in this field.[15] Comparative analysis of the changes in the 3 years before and after by keywords shows that people mainly focused on risk factors, trauma mechanisms, epidemiology, diagnosis, fixation, complications, and management of fractures in children.

Musculoskeletal disorders caused by bone density have been of interest. With the COVID-19 pandemic, there has been a rising concern about the prevalence of COVID-19 among pediatrics. Keyword clustering demonstrates the structure of knowledge in the field and the dynamic change process. The smaller the cluster code, the larger the number of nodes contained in that cluster.[16] Furthermore, summarize and sort out the research hotspots in this field from 2017 to 2019. The topic of bone density leading to skeletal disorders has received much attention.[17] The role of some microscopic molecules in bone formation such as disorders of calcium and phosphorus secreted by parathyroid glands, vitamin D, and alkaline phosphatase causing bone diseases and bisphosphonates for bone diseases. Bone diseases such as osteoporosis and osteogenesis imperfecta are a popular category of concern. Another category of greater interest is pediatric fractures:[18,19] management of supracondylar humerus fractures in children; management of Monteggia fractures in children; diagnosis and therapy of forearm fractures, and which the diagnosis and treatment of distal radius fractures using ultrasound in children are likely to be a hot issue for future research; reconstruction of fractures and ligament injuries within the knee joint; and management of ankle fractures including epiphyseal injuries in children. Head injuries and dental injuries in children caused by abuse and trauma are also a category that needs attention.[20,21] Summarize and sort out the research hotspots in this field from 2020 to 2022. The attention is still highest on the topic of bone diseases associated with bone density:[22] disorders of microscopic molecules in the formation of bones, such as vitamin D, calcium-causing bone diseases, and the treatment of bisphosphonates in bone diseases; osteoporosis, osteogenesis imperfecta, and pathological fractures due to skeletal diseases. There is increased interest in the epidemiology of children,[5,23] risk factors, and causes of childhood trauma, especially brain injuries[24] and dental injuries.[25] Possible reasons for this phenomenon are the pandemic of COVID-19, the restricted range of people's activities, the increased time children spend at home, and the increased chance of injury due to prolonged stays in small spaces making people more anxious. Children's forearm fractures, supracondylar humerus fractures, and the reconstruction of ligament damage and fractures in the knee joint are the current hotspots for pediatric fractures.

When a third article simultaneously cites two other papers, this is called a co-citation relationship. Co-citation analysis of references is the highlight of Citespace 6.1.R6 software. The 10 articles that attracted the most attention were about measuring quality, data collection, and evaluation in the field of bone densitometry, and interpretation and reporting of bone densitometry results;[26–28] new clinical classification of osteogenesis imperfecta and related treatment;[29,30] epidemiological characteristics of fractures in children,[31] causes, and diagnosis of abusive head injuries,[20,32] and treatment of forearm fractures and tibial eminence fractures in children.[18,19] These high co-citations references provide a guide for scholars who understand this field.

Conclusion

Skeletal diseases due to bone mineral density in children have been a hotspot topic. Treatment for pediatric fractures, including supracondylar humeral fractures, forearm fractures, and knee fractures, is another topic of greater interest. Head injuries and dental injuries in children due to abuse and trauma are also concerning issues. Researchers and clinicians can quickly learn about topics of interest through authoritative journals and highly cited literature and rapidly master the current status and frontiers of the field through study, providing ideas for future work. With the COVID-19 pandemic, researchers have progressively raised concerns about the epidemiology, risk factors, and causes of childhood trauma. These characteristics are used as a guide for dealing with public health incidents and provide valuable recommendations for dealing with some public health emergencies.

Author contributions

H.W. participated in protocol design and article writing in the study. Y.T.Y. participated in the data analysis, review, and editing of the study. Q.D.L. and C.X.L. further revised the article. H.A.B. collected data and provided technical support. J.J.W. provided support for software and methods. Q.J. proposed the study protocol, supervised its implementation, and revised the article. All authors contributed to the article and approved the submitted version.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical committee approval was not required for this study. The study program was approved by the Institutional Review Board of the executive agency.

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Supplemental material

Supplemental material for this article is available online.

References

1. Richard AN, Robert D, Valentin D, et al. Potential impact of seasonal forcing on a SARS-CoV-2 pandemic. *Swiss Med Wkly* 2020; 150: w20224.

2. Parisien RL, Shin M, Trofa DP, et al. Telehealth utilization in response to the COVID-19 pandemic in pediatric orthopaedic surgery. *J Am Acad Orthop Surg* 2021; 29(24): 1053–1060.
3. Azman AS and Luquero FJ. From China: hope and lessons for COVID-19 control. *Lancet Infect Dis* 2020; 20(7): 756–757.
4. Lazarus JV, Ratzan SC, Palayew A, et al. A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med* 2021; 27(2): 225–228.
5. Bram JT, Johnson MA, Magee LC, et al. Where have all the fractures gone? The epidemiology of pediatric fractures during the COVID-19 pandemic. *J Pediatr Orthop* 2020; 40(8): 373–379.
6. Wong JSH and Cheung KMC. Impact of COVID-19 on orthopaedic and trauma service: an epidemiological study. *J Bone Joint Surg Am* 2020; 102(14): e80.
7. Agarwal A, Durairajanayagam D, Tatagari S, et al. Bibliometrics: tracking research impact by selecting the appropriate metrics. *Asian J Androl* 2016; 18(2): 296–309.
8. Bornmann L, Haunschild R and Hug SE. Visualizing the context of citations referencing papers published by Eugene Garfield: a new type of keyword co-occurrence analysis. *Scientometrics* 2018; 114(2): 427–437.
9. Wu HY, Li YQ, Tong LJ, et al. Worldwide research tendency and hotspots on hip fracture: a 20-year bibliometric analysis. *Arch Osteoporos* 2021; 16(1): 73.
10. Liu Z, Cheng Y, Hai Y, et al. Developments in congenital scoliosis and related research from 1992 to 2021: a thirty-year bibliometric analysis. *World Neurosurg* 2022; 164: e24–e44.
11. Wu H, Wang Y, Tong L, et al. The global research trends and hotspots on developmental dysplasia of the hip: a bibliometric and visualized study. *Front Surg* 2021; 8: 671403.
12. Biglu MH, Ghavami M, Biglu S. Authorship, institutional and citation metrics for publications on postmenopausal osteoporosis. *Osteoporos Int* 2014; 25(4): 1337–1343.
13. Wu H, Cheng K, Guo Q, et al. Mapping knowledge structure and themes trends of osteoporosis in rheumatoid arthritis: a bibliometric analysis. *Front Med* 2021; 8: 787228.
14. Bastian S, Ippolito JA, Lopez SA, et al. The use of the h-index in academic orthopaedic surgery. *J Bone Joint Surg Am* 2017; 99(4): e14.
15. Wang XY, Guo JJ, Gu DX, et al. Tracking knowledge evolution, hotspots and future directions of emerging technologies in cancers research: a bibliometrics review. *J Cancer* 2019; 10(12): 2643–2653.
16. Zhang XY, Liao X, Liu XM, et al. [Analysis of outcomes of randomized controlled trial on compound Chinese herbal medicine formulas in treatment of vascular cognitive impairment caused by cerebral small vessel]. *Zhongguo Zhong Yao Za Zhi* 2020; 45(23): 5804–5818.
17. Shuhart CR, Yeap SS, Anderson PA, et al. Executive summary of the 2019 ISCD position development conference on monitoring treatment, DXA cross-calibration and least significant change, spinal cord injury, peri-prosthetic and orthopedic bone health, transgender medicine, and pediatrics. *J Clin Densitom* 2019; 22(4): 453–471.
18. Pace JL. Pediatric and adolescent forearm fractures: current controversies and treatment recommendations. *J Am Acad Orthop Surg* 2016; 24(11): 780–788.
19. Gans I, Baldwin KD and Ganley TJ. Treatment and management outcomes of tibial eminence fractures in pediatric patients: a systematic review. *Am J Sports Med* 2014; 42(7): 1743–1750.
20. Choudhary AK, Servaes S, Slovis TL, et al. Consensus statement on abusive head trauma in infants and young children. *Pediatr Radiol* 2018; 48(8): 1048–1065.
21. Petti S, Glendor U and Andersson L. World traumatic dental injury prevalence and incidence, a meta-analysis—one billion living people have had traumatic dental injuries. *Dent Traumatol* 2018; 34(2): 71–86.
22. Lips P, Cashman KD, Lamberg-Allardt C, et al. Current vitamin D status in European and Middle East countries and strategies to prevent vitamin D deficiency: a position statement of the European Calcified Tissue Society. *Eur J Endocrinol* 2019; 180(4): P23–P54.
23. Holt JB, Glass NA and Shah AS. Understanding the epidemiology of pediatric supracondylar humeral fractures in the United States: identifying opportunities for intervention. *J Pediatr Orthop* 2018; 38(5): E245–E251.
24. Kovler ML, Ziegfeld S, Ryan LM, et al. Increased proportion of physical child abuse injuries at a level I pediatric trauma center during the Covid-19 pandemic. *Child Abuse Negl* 2021; 116: 104756.
25. Bourguignon C, Cohenca N, Lauridsen E, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. *Dent Traumatol* 2020; 36(4): 314–330.
26. Crabtree NJ, Arabi A, Bachrach LK, et al. Dual-energy X-ray absorptiometry interpretation and reporting in children and adolescents: the revised 2013 ISCD Pediatric Official Positions. *J Clin Densitom* 2014; 17(2): 225–242.
27. Gordon CM, Leonard MB, Zemel BS, et al. 2013 Pediatric position development conference: executive summary and reflections. *J Clin Densitom* 2014; 17(2): 219–224.
28. Golden NH, Abrams SA and Committee on Nutrition. Optimizing bone health in children and adolescents. *Pediatrics* 2014; 134(4): e1229–e1243.
29. Bishop N, Adami S, Ahmed SF, et al. Risedronate in children with osteogenesis imperfecta: a randomised, double-blind, placebo-controlled trial. *Lancet* 2013; 382(9902): 1424–1432.
30. Van Dijk FS and Sillence DO. Osteogenesis imperfecta: clinical diagnosis, nomenclature and severity assessment. *Am J Med Genet A* 2014; 164A(6): 1470–1481.
31. Naranje SM, Erali RA, Warner WC, et al. Epidemiology of pediatric fractures presenting to emergency departments in the United States. *J Pediatr Orthop* 2016; 36(4): E45–E48.
32. Leonard JR, Jaffe DM, Kuppermann N, et al. Cervical spine injury patterns in children. *Pediatrics* 2014; 133(5): e1179–e1188.