



RESEARCH

CHRONIC PAIN MANAGEMENT IN GERIATRIC PATIENTS: ANALYSIS OF AN ALGOLOGY CLINIC'S DATA

Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2022.267
2022; 25(1): 97-105

- Damla YÜRÜK¹ 
- Gevher Rabia GENÇ PERDECİOĞLU¹ 

CORRESPONDANCE

¹ Damla YÜRÜK

Health Sciences University Diskapi Yıldırım
Beyazıt Research&Training Hospital ,
Algology Clinic, Ankara, Turkey

Phone: +905319932378
e-mail: damlayuruk@hotmail.com

Received: Nov 20, 2021
Accepted: Jan 22, 2022

¹ Health Sciences University Diskapi Yıldırım
Beyazıt Research&Training Hospital ,
Algology Clinic, Ankara, Turkey

ABSTRACT

Introduction: The aim of this study is to examine whether the number of admissions to an algology outpatient clinic , the cause of pain and application of interventional procedures of pain change with advanced age.

Materials and Method: Data of patients who admitted to Algology Outpatient Clinic between 1 January and 31 December 2019 were retrospectively evaluated. Patients were divided into two groups: patients being <65-year-old (Group I) and ≥65-year-old (Group II). The comparative statistical analyses were performed between the groups.

Results: 5559(60.4%) patients were <65 years old (group I) and 3635(39.5%) patients were ≥65 years old (group II). The rate of myofascial pain ($p<0.001$), spinal pain ($p= 0.020$), headache ($p<0.001$), dorsal/chest pain ($p= 0.042$) and, pelvic pain ($p<0.001$) were considerably higher in group I. The rate of joint pain ($p<0.001$) was higher in group II. The rate of combined drug therapy and intervention among group II (58.8%) was higher than group I (51.7%) ($p<0.001$). Trigger point injection was the most common interventional procedure in both groups.

Conclusion: Fewer elderly patients than younger adult patients are applying to the Algology Outpatient Clinic. In the elderly, joint-related pain in particular is much more common than in young adults. In the treatment of chronic pain, interventional methods added to pharmacological treatment are more common in elderly patients than young adults.

Keywords: Pain; Aged; Diagnosis.

INTRODUCTION

Chronic pain management consists of a multidisciplinary approach that can include pharmacological therapy, physical therapy, interventional procedures, and surgery (1). It is important to establish treatment with the awareness that there are age-related pharmacokinetic changes in the elderly: with aging, all pharmacokinetic phases of drugs related to metabolism, absorption, elimination, and distribution volumes may be affected. Furthermore, with advanced age, the risk of adverse drug reactions increases due to the narrow therapeutic index of most drugs (2).

Interventional methods applied in pain clinics provide advantages in many ways in elderly patients who do not benefit from pharmacological treatments or cannot continue treatment due to side effects. Interventional methods can reduce the need for surgery, the risk of complications is less than surgeries and since they are administered with mild sedation, patients can be discharged on the same day (3).

In studies investigating the profile of patients diagnosed and treated in pain clinics, the cause of pain and the treatments applied were frequently compared, but comparisons related to age were limited. Defining pain, determining its cause, and planning its management can be more difficult in elderly patients than young adults. Neuromuscular and cognitive disorders, which are also more common in the elderly, can complicate communication and identifying the cause of pain (4). Furthermore, many elderly people or caregivers thereof do not report their pain because they think it is a natural consequence of aging (5).

Chronic pain is one of the most common health problems in elderly people (> 65 years), causing disability by impairing mood, sleep, cognition, and daily living activities. In the elderly, age-related physiological changes and the presence of systemic diseases that predispose to pain pose a risk for chronic pain and its treatment (6). With the elderly population increasing rapidly throughout the world,

pain management in the elderly is gaining importance. Therefore, gathering data on possible pain treatments for the elderly is important.

The aim of this study is to examine whether the number of admissions to an algology outpatient clinic, the cause of pain and application of interventional procedures of pain change with advanced age. The results of the study can identify the services provided by pain specialists to the elderly and enable them to be developed further. It may raise awareness among the elderly, their caregivers and physicians so that the elderly can benefit more from pain clinics in the treatment of chronic pain.

MATERIAL AND METHODS

Ethical approval

Ethical approval of the current study was obtained from the Clinical Research Ethics Committee of the University of Health Sciences, Dışkapı Yıldırım Beyazıt Training and Research Hospital, on 28.06.2021 (Approval Number: 114/01). The Helsinki Declaration criteria were taken into consideration in the conduct of the study.

Study population

The clinical and demographic data of 9194 patients who admitted to Algology Outpatient Clinic between 1 January and 31 December 2019 were retrospectively evaluated. To access these data, with the Origo HBYS program used by the hospital's information processing unit on selected dates, the records of all patients who applied to the Algology Outpatient Clinic were accessed. With this computer transcript, the files of the patients who applied to Algology Outpatient Clinic were accessed. The data of the patients whose files could be accessed and whose records were available were evaluated.

According to the data obtained the patients were divided into two groups: patients being <65-year-old (Group I) and ≥65-year-old (Group II). Among them, only those who received drug therapy



(non-steroidal anti-inflammatories, opioids and adjuvant analgesics) and those who underwent interventional procedures (trigger point injection, genicular, suprascapular, femoral, and obturator nerve block/ RF, facet medial nerve block/ RF, intra-articular injection, epidural steroid injection, transforaminal epidural steroid injection/dorsal root ganglion RF, occipital and trigeminal nerve block/RF, intercostal nerve block and erector spina plane block/ RF, gasser and sphenopalatine ganglion block/RF, ilioinguinal, iliohypogastric, genitofemoral, pudendal, and impar ganglion block/RF, epiduroscopy, stellate and lumbar sympathetic ganglion block/ RF, epidural port catheter, spinal cord stimulation, splanchnic ganglion block/RF) in addition to drug therapy were determined.

In addition, the types of interventional procedures and the causes of pain (myofascial pain, spinal pain, joint pain, headache, dorsal/chest pain, pelvic pain, ischemic pain, abdominal pain) in patients who underwent interventional procedures were determined. The comparative statistical analyses were performed between the groups and genders.

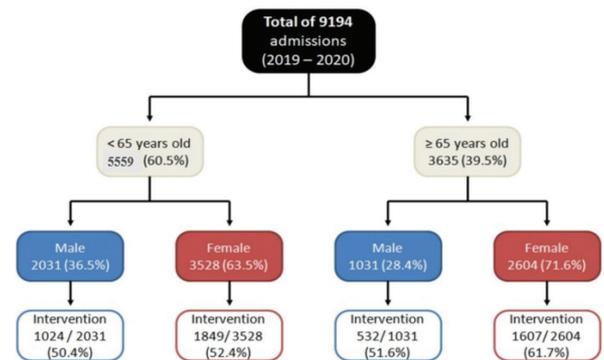
Statistical Analysis

The Statistical Package for Social Sciences version 2015 (SPSS Inc, USA) was used for statistical analysis. The graphics were created using Microsoft Excel 2007 (Microsoft Inc, USA). Along with the Kolmogorov-Smirnov normality test ($p < 0.001$), the visual inspection of histograms, normal Q-Q plots, and box plots showed that the variable "age" did not reveal normal distribution, thus it was presented as median (minimum – maximum) value. The comparisons of qualitative variable between two groups were performed using Mann-Whitney U test. The quantitative variables were presented as frequency and percent, and Pearson chi-square test or Fischer's exact test was used to make comparison between two groups. A p value of < 0.05 was considered as significant.

RESULTS

Among 9194 patients admitted to our Algology Outpatient Clinic the median age of the study population was 62 years (17 – 103 years). 5559 (60.5%) patients were < 65 years old and 3635 (39.5%) patients were ≥ 65 years old. The rate of females were significantly higher in both age groups [Pearson: 66.081, $p < 0.001$]; 6132 (66,9%) patients were female and 3062 (33.3%) patients were male (Figure 1).

Figure 1. The distribution of the patients who admitted to Algology Outpatient Clinic in 2019.

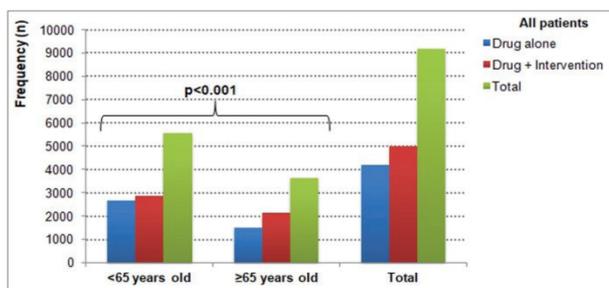


While all these patients were given medication for relief of pain, 5012 patients received one kind of intervention in addition to drug therapy. As revealed in Figure 2, the rate of combined drug therapy and intervention among the patients ≥ 65 years old was higher than that of the patients less than 65 years old [58.8% versus 51.7%, Pearson: 45.47, $p < 0.001$].

Myofascial pain syndrome [$n = 1965$ (39.2%)] was the most common diagnosis of 5012 patients received one kind of intervention in addition to drug therapy, which was followed by spinal pain [$n = 1367$ (27.3%)] and joint pain [$n = 1328$ (26.5%)], respectively. As for the diagnosis, the rate of myofascial pain syndrome ($p < 0.001$), spinal pain ($p = 0.020$), headache ($p < 0.001$), dorsal/chest pain ($p = 0.042$), and pelvic pain ($p < 0.001$) were considerably higher in group I. In contrary, the rate of joint pain ($p < 0.001$)

was significantly higher in group II. Ischemic ($p=0.529$) and abdominal pain ($p=0.741$) did not reveal significant difference between the groups (Table 1).

Figure 2. The distribution of drug therapy alone and combined drug therapy and intervention in all patients admitted to Algology Outpatient Clinic



The distribution of the interventions applied was presented in Table 2. The rate of trigger point injection ($p<0.001$), transforaminal epidural steroid injection or dorsal root ganglion radiofrequency (RF) ($p=0.001$), occipital and trigeminal nerve block with RF ($p<0.001$), intercostal block or erector spinal plane block ($p=0.042$), Gasser and sphenopalatin ganglion block with RF ($p=0.001$), and ilioinguinal, iliohypogastric, genitofemoral, pudental, impar ganglion block with RF ($p<0.001$) were significantly higher in group I. However, only genicular, suprascapular, femoral, obturator nerve block with RF ($p<0.001$) was significantly higher in group II.

DISCUSSION

It has been reported that more than 50% of the elderly population experiences chronic pain. Of these, 70% complain of pain in more than one region, and

Table 1. The demographic and clinical characteristics of 5012 patients received one kind of intervention in addition to drug therapy.

Variable	All patients (n=5012)	Group I (<65 years old) (n=2873)	Group II (≥65 years old) (n=2139)	p value
Gender				
Male	1556 (31%)	1024 (35.6%)	532 (34.9%)	<0.001^a
Female	3456 (69%)	1849 (64.4%)	1607 (75.1%)	
Diagnosis				
Myofascial pain syndrome	1965 (39.2%)	1206 (42%)	759 (35.5%)	<0.001^a
Spinal pain	1367 (27.3%)	820 (28.5%)	547 (25.6%)	0.020 ^a
Joint pain	1328 (26.5%)	587 (20.4%)	741 (34.6%)	<0.001^a
Headache	179 (3.6%)	142 (4.9%)	37 (1.7%)	<0.001^a
Dorsal/Chest pain	127 (2.5%)	84 (2.9%)	43 (2.0%)	0.042 ^a
Pelvic pain	19 (0.4%)	19 (0.7%)	0 (0%)	<0.001^b
Ischemic pain	18 (0.4%)	9 (0.3%)	9 (0.4%)	0.529 ^a
Abdominal pain	9 (0.2)	6 (0.2%)	3 (0.1%)	0.741 ^b

Note that * indicates median (minimum – maximum) values. The p values written in bold represent statistical significance. ^a indicates Pearson chi-square test. ^b indicates Fischer's exact test.



Table 2. The distribution of the interventions applied in overall and between the groups.

Variable	All patients (n=5012)	Group I (<65 years old) (n=2873)	Group II (≥65 years old) (n=2139)	p value
Trigger point injection	1965 (39.2%)	1206 (42%)	759 (35.5%)	<0.001 ^a
Genicular, suprascapular, femoral, and obturator nerve block/ RF	806 (16.1%)	301 (10.5%)	505 (23.6%)	<0.001 ^a
Facet medial nerve block/ RF	695 (13.9%)	397 (13.8%)	298 (13.9%)	0.908 ^a
Intra-articular injection	522 (10.4%)	286 (10%)	236 (11%)	0.216 ^a
Epidural steroid injection	395 (7.9%)	237 (8.2%)	158 (7.4%)	0.262 ^a
Transforaminal epidural steroid injection/dorsal root ganglion RF	251 (5%)	169 (5.9%)	82 (3.8%)	0.001 ^a
Occipital and trigeminal nerve block/RF	152 (3%)	118 (4.1%)	34 (1.6%)	<0.001 ^a
Intercostal nerve block and erector spina plane block/RF	127 (2.5%)	84 (2.9%)	43 (2.0%)	0.042 ^a
Gasser and sphenopalatine ganglion block/RF	27 (0.5%)	24 (0.8%)	3 (0.1%)	0.001 ^b
Ilioinguinal, iliohypogastric, genitofemoral, pudendal, and impar ganglion block/RF	19 (0.4%)	19 (0.7%)	0 (0%)	<0.001 ^b
Epiduroscopy	22 (0.4%)	14 (0.5%)	8 (0.4%)	0.548 ^a
Stellate and lomber sympathetic ganglion block/RF	18 (0.4%)	9 (0.3%)	9 (0.4%)	0.529 ^a
Epidural port catheter	6 (0.1%)	4 (0.1%)	2 (0.1%)	1.0 ^b
Spinal cord stimulation	4 (0.1%)	3 (0.1%)	1 (0.05%)	0.641 ^b
Splanchnic ganglion block/RF	3 (0.1%)	2 (0.1%)	1 (0.05%)	1.0 ^b

Abbreviations: RF: radiofrequency. The p values written in bold represent statistical significance. ^b indicates Pearson chi-square test. ^c indicates Fischer's exact test.

85% have a chronic disease accompanied by pain; age-related falls and other health problems further increase the risk of pain (7). In this study, patients over 65 years of age constituted only 39.5% of the patients who applied to the Algology Clinic. The rate of admission due to pain decreased with advanced age, which may be due to the inadequate referral of elderly patients, who are often overly dependent on their relatives and caregivers, to the clinic.

In studies evaluating patients who applied to the Algology Clinic in Turkey, the number of women was reported to be higher than the number of men (8,9). Furthermore, a study in which only elderly patients

were evaluated showed that incidence of pain was reported to be higher in women than in men (10). In this study, the number of women (66.9%) who applied to the Algology Outpatient Clinic was higher than the number of men in both groups. Studies showing that women have a lower pain threshold, higher pain intensity, and less pain tolerance than men support these results (11,12). In addition, women may be able to express pain more easily, while men may have difficulties expressing pain.

Pharmacokinetic changes, such as decreased drug absorption; variability in volume of distribution due to drug lipophilicity; increased therapeutic response to protein-bound drugs due to hypoalbuminemia

minemia; and decreased renal elimination and hepatic metabolism, are often seen in elderly patients (13). In addition, drug interactions during the use of analgesic drugs are more common in elderly patients due to additional drugs being used for systemic diseases (14). Multimodal treatment is often required in the treatment of chronic pain. For this, drugs with various mechanisms of action that create a synergistic effect are used together. However, multimodal treatment is more difficult to apply in the elderly than young adults because of side effects related to polypharmacy (15). Therefore, with regard the pharmacological aspect of chronic pain treatment of the elderly, additional non-drug treatments are required, one of which is interventional procedures.

Rather than the treatment of the underlying pathology, the aim of interventional pain treatment is to prevent the transmission or perception of pain signals. It is less invasive than surgery, has lower risk of complications, and does not require a long hospital stay. Moreover, the risk of serious complications in these treatments, which are applied under the guidance of fluoroscopy and ultrasonography, can be minimized (16). Patients who may benefit from interventional procedures are those who do not have a strong indication for surgery, who are unsuitable surgical candidates due to age or medical comorbidities, or who cannot tolerate oral pain medications at doses necessary to control their symptoms (17), which includes most elderly patients with chronic pain. In this study, the rate of interventional procedures combined with drug therapy was higher in patients over 65 years of age (58.8%) than patients under 65 years of age (51.7%).

Myofascial pain syndrome was the most common reason for application of interventional procedure for both elderly and young adult patients in this study, and trigger point injection was the most common procedure. Both exercise and trigger point injection are recommended in the treatment of myofascial pain (18). Nonsteroidal anti-inflamma-

tory drugs (NSAIDs) may increase the risk of heart failure symptoms (19) and cause prothrombotic activity in patients who are at risk for major vascular events (20). Therefore, NSAIDs should be used with caution in elderly patients, for whom cardiac and renal diseases are more common.

Myofascial pain syndrome was the most common reason for application of interventional procedure for both elderly and young adult patients in this study, and trigger point injection was the most common procedure. In this study, the number of elderly patients who applied to the Algology Out-patient Clinic with the complaint of joint pain and underwent interventional procedure was found to be higher than that of young adults. In our clinic, the first choice for interventional treatment of joint pain is usually intra-articular injection; in patients who do not respond to this, a combined radiofrequency ablation (RFA) therapy with nerve blocks (genicular nerve for knee; suprascapular nerve for shoulder; femoral and obturator nerves for hip) associated with the pain sensation of the joint is applied. In this study there was no difference in the frequency of intra-articular injection between patients over 65 years of age and under 65 years of age (51.7%); however, genicular, suprascapular, femoral, and obturator nerve block/RFA was more common in patients over 65 years of age than in under 65 years of age. This result shows that elderly patients need more advanced interventional procedures for the treatment of joint pain compared to young adults.

There are studies suggesting that the prevalence of chronic low back pain (LBP), which is the most common cause of spinal pain, gradually increases from young adulthood to age 60 then declines (21). However, some studies have revealed that LBP is common among older adults (22). In this study, interventional procedures applied for spinal pain causing low back and neck pain in patients under 65 years of age were found to be more than patients over 65 years of age. Transforaminal epidural steroid injection/dorsal root ganglion radiofrequency



(RF), which is applied in the treatment of radicular pain of the low back and neck, was observed to be applied more frequently in young adult than elderly patients. This may be because disc herniation, which causes radicular pain, is more common in young adults. It is known that degenerative spine-related pain (facet syndrome and spinal stenosis) mostly affects the elderly population. However, there was no significant difference between the groups in terms of application of facet medial nerve block/RF and epidural steroid injection.

Primary headaches peak around the age of 40, and their frequency decreases with age. However, although primary headaches (tension-type headache, migraine, hypnic headache) are more common than secondary headaches in the elderly, the incidence of secondary headaches increases with advanced age. In this study and in line with the literature, rates of headache-related pain, occipital nerve, trigeminal nerve, gasser ganglion, and sphenopalatine ganglion block/RF application were higher in patients under 65 years of age than patients over 65 years of age. A change in chronic-headache pattern or new-onset headache in advanced age is suggestive of a secondary headache (subarachnoid or intracranial hemorrhage; temporal or giant cell arteritis; central nervous system tumors) in elderly individuals and requires further investigation (23). Pharmacological therapy is the cornerstone of headache management (24). Interventional pain methods are frequently used with elderly patients who are resistant to pharmacological treatments or who cannot tolerate pharmacological treatment

due to comorbidities (25). These techniques include occipital nerve block, sphenopalatine ganglion block/RF, and gasser ganglion block/RF (26). There are many studies suggesting that these methods are both effective and lasting (27).

In this study, the data of patients who applied to the Algology outpatient clinic were examined retrospectively between 1 January and 31 December 2019 before the COVID-19 pandemic. Thus, it contains the most up-to-date data that can be obtained before the pandemic. In this study; the number of applications to the algology outpatient clinic, the number of drugs and interventional procedures, and the cause of pain in those who underwent interventional procedures were compared between the elderly and young adults. However, the cause of pain in those receiving only drug therapy was not evaluated so this is the limitation of this study.

CONCLUSIONS

Fewer elderly patients than younger adult patients are applying to the Algology Outpatient Clinic. Myofascial pain is the most common reason that both elderly and young adult patients apply to the Algology Outpatient Clinic. In the elderly, joint-related pain in particular is much more common than in young adults. In the treatment of chronic pain, interventional methods added to pharmacological treatment are more common in elderly patients than young adults. For this reason, it would be beneficial to develop and expand non-drug treatment practices for chronic pain in elderly patients.

REFERENCES

1. Hylands-White N, Duarte RV, Raphael JH. An overview of treatment approaches for chronic pain management. *Rheumatol Int* 2017 ;37(1):29-42. (PMID: 27107994)
2. Andres TM, McGrane T, McEvoy MD, Allen BFS. Geriatric Pharmacology: An Update. *Anesthesiol Clin* 2019;37(3):475-492. (PMID: 31337479)
3. Brooks AK, Udoji MA. Interventional Techniques for Management of Pain in Older Adults. *Clin Geriatr Med* 2016;32(4):773-785. (PMID: 27741969)
4. Pan X, Meng H. Pain management and cognitive function among older adults: an exploratory study of the China Health and Retirement Longitudinal Study. *Aging Clin Exp Res* 2020 ;32(12):2611-2620. (PMID: 32056155)

5. Herr KA, Garand L. Assessment and measurement of pain in older adults. *Clin Geriatr Med* 2001;17(3):457-478. (PMID: 11459715)
6. Bicket MC, Mao J. Chronic Pain in Older Adults. *Anesthesiol Clin* 2015 ;33(3):577-90. (PMID: 26315639)
7. Patel KV, Guralnik JM, Dansie EJ, Turk DC. Prevalence and impact of pain among older adults in the United States: findings from the 2011 National Health and Aging Trends Study. *Pain* 2013;154(12):2649-2657. (PMID: 24287107)
8. Ayvat PU, Aydin ON, Oğurlu M. Sociodemographic properties and pain prevalence of patients applying to the Algology Department polyclinic of Adnan Menderes University Medical Faculty. *Agri* 2011;23(1):28-39. (PMID: 21341150)
9. Koçoğlu D, Özdemir L. The relation between pain and pain beliefs and sociodemographic-economic characteristics in an adult population. *Agri* 2011 ;23(2):64-70. (PMID: 21644106)
10. Tsai YF, Liu LL, Chung SC. Pain prevalence, experiences, and self-care management strategies among the community-dwelling elderly in Taiwan. *J Pain Symptom Manage* 2010;40(4):575-81. (PMID: 20678896)
11. Riley JL 3rd, Robinson ME, Wise EA, Myers CD, Fillingim RB. Sex differences in the perception of noxious experimental stimuli: a meta-analysis. *Pain* 1998;74(2-3):181-7. (PMID: 9520232)
12. Chesterton LS, Barlas P, Foster NE, Baxter DG, Wright CC. Gender differences in pressure pain threshold in healthy humans. *Pain* 2003;101(3):259-266.(PMID:12583868)
13. Andres TM, McGrane T, McEvoy MD, Allen BFS. *Geriatric Pharmacology: An Update*. *Anesthesiol Clin* 2019 ;37(3):475-492. (PMID: 31337479)
14. Swart F, Bianchi G, Lenzi J et al. Risk of hospitalization from drug-drug interactions in the Elderly: real-world evidence in a large administrative database. *Aging* 2020; 5;12(19):19711-19739. (PMID: 33024058)
15. Hoel RW, Giddings Connolly RM, Takahashi PY. Polypharmacy Management in Older Patients. *Mayo Clin Proc* 2021;96(1):242-256. (PMID: 33413822)
16. Boswell MV, Trescot AM, Datta S et al. Interventional techniques: evidence-based practice guidelines in the management of chronic spinal pain. *Pain Physician* 2007;10(1):7-111. (PMID: 17256025)
17. Iannuccilli JD, Prince EA, Soares GM. Interventional spine procedures for management of chronic low back pain-a primer. *Semin Intervent Radiol* 2013; 30(3):307-17. (PMID: 24436553)
18. Borg-Stein J, Iaccarino MA. Myofascial pain syndrome treatments. *Phys Med Rehabil Clin N Am* 2014;25(2):357-74. (PMID: 24787338)
19. Schmidt M, Lamberts M, Olsen AM et al. Cardiovascular safety of non-aspirin non-steroidal anti-inflammatory drugs: review and position paper by the working group for Cardiovascular Pharmacotherapy of the European Society of Cardiology. *Eur Heart J* 2016;37(13):1015-23.(PMID: 26984863)
20. Coxib and traditional NSAID Trialists' (CNT) Collaboration, Bhalra N, Emberson J et al. Vascular and upper gastrointestinal effects of non-steroidal anti-inflammatory drugs: meta-analyses of individual participant data from randomised trials. *Lancet* 2013;382(9894):769-79. (PMID: 23726390)
21. Papageorgiou AC, Croft PR, Ferry S, Jayson MI, Silman AJ. Estimating the prevalence of low back pain in the general population. Evidence from the South Manchester Back Pain Survey. *Spine* 1995;20(17):1889-94. (PMID: 8560337)
22. Fernández-de-Las-Peñas C, Alonso-Blanco C, Hernández-Barrera V, Palacios-Ceña D, Jiménez-García R, Carrasco-Garrido P. Has the prevalence of neck pain and low back pain changed over the last 5 years? A population-based national study in Spain. *Spine J* 2013;13(9):1069-76. (PMID: 23578987)
23. Sharma TL. Common Primary and Secondary Causes of Headache in the Elderly. *Headache* 2018;58(3):479-484. (PMID: 29322494)



24. Ozge A, Termine C, Antonaci F, Natriashvili S, Guidetti V, Wöber-Bingöl C. Overview of diagnosis and management of paediatric headache. Part I: diagnosis. *J Headache Pain* 2011;12(1):13-23 (PMID: 21359874)
25. Wahezi SE, Silva K, Shaparin N et al. Currently Recommended TON Injectate Volumes Concomitantly Block the GON: Clinical Implications for Managing Cervicogenic Headache. *Pain Physician* 2016;19(7):E1079-1086. (PMID: 27676679)
26. Koehler PJ, Boes CJ. A history of non-drug treatment in headache, particularly migraine. *Brain* 2010;133(Pt 8):2489-2500. (PMID: 20639545)
27. Gupta R, Fisher K, Pyati S. Chronic Headache: a Review of Interventional Treatment Strategies in Headache Management. *Curr Pain Headache Rep* 2019 ;23(9):68. (PMID: 31359257)