American Journal of
Epidemiology & Public Health

Research Article

Epidemiology of Headache Disorders among Pharmacy Students -

Mohammad F.Bostanudin[1]*, Shaden Al Atassi[1#] and Tan S. Fei[2#]

[1]*College of Pharmacy, Al Ain University, Abu Dhabi 112612, United Arab Emirates*

[2]*School of Pharmacy, Management & Science University, University Drive, Off Persiaran Olahraga, Section 13, 40100 Shah Alam, Selangor Darul Ehsan, Malaysia*

[#]*Authors contributed equally to this work*

***Address for Correspondence:** Mohammad F. Bostanudin, College of Pharmacy, Al Ain University, Abu Dhabi 112612, UAE, Tel: +971-244-446-96;
E-mail: mohammad.bostanudin@aau.ac.ae

Submitted: 25 January 2020; **Approved:** 12 February 2020; **Published:** 13 February 2020

Cite this article: Bostanudin MF, Atassi SA, Fei TS. Epidemiology of Headache Disorders among Pharmacy Students. American J Epidemiol Public Health. 2020;4(1): 001-005.

ISSN: 2644-0032

ABSTRACT

Background: Headache is one of the most common nervous system disorders that affecting people worldwide and has been frequently investigated in research studies due to high prevalence. Although unfavourably underestimated among student population, it has been associated with significant negative outcomes including quality of life deterioration and functional impairment. As pharmacy students is considered to have better exposure to public health concepts and may serve an important role in the future quality of care in the community, therefore investigating headache epidemiology among them may be beneficial.

Methods: A cross-sectional descriptive study has been conducted involving undergraduate pharmacy students of Al Ain University, United Arab Emirates to determine the prevalence, characteristics, impacts, and behavioural management of headache among them. Self-administered questionnaire was adapted and adopted based on the International Headache Society criteria and the resulting data were analysed using SPSS version 22.

Results: The results showed that 82.6% of respondents suffered from headache in the last 12 months, with 86.4% of them were females and 13.6% were males. Among popular headache-triggering factors were stress, examinations, and insufficient rest. Around 48.2% of the drug users opted paracetamol as their drug of choice with only 24.8% of them sought advice from healthcare professionals.

Conclusion: Having demonstrated high prevalence without appropriate treatment, as well as lack of education and awareness, this demand comprehensive approach to elevate the life quality among individuals who are affected with such disorders.

Keywords: Headache; Analgesics; Pharmacy; University; UAE

INTRODUCTION

Studies on the epidemiology of headache disorders exemplify the enormous burden imposed by headache symptoms concerning human suffering and cost [1]. Having shown over 90% people encountered headache minimum once in a year [2], it also may influence life quality of the university students as many studies have been done on the undergraduate students worldwide to investigate the impact and prevalence of headache among them [2-6]. However, progress in the treatment of headache disorders has been seriously impeded by low tendency of sufferers in seeking medical care and this has worsen the socioeconomic impact [7] despite being the top ten risk factors of disability worldwide [8].

Under-diagnosed and under-treated of headache disorders are the most common scenario that happened among students, in which have negatively impacted their academic performance [9]. In concerted efforts to treat headache, analgesics have become the most common class of drugs used however, most of sufferers have been found to practice self-medication resulting in inappropriate treatment and refractory-type headache as well as analgesic-overuse headache [5,10]. In most countries, students have been reported to consume over the counter drugs without proper physicians' consultation [11]. A study involving 720 students has reported that around 81.1% of them experienced headache; 72.5% of them used analgesics, which were mostly paracetamol (64.10%) and Diclofenac (24.7%) [6]. This therefore has raised the concern of drug safety in relation to the potential contraindications, dosing manner and drug interactions of analgesics.

To our knowledge, no investigations into the prevalence of headache on undergraduate pharmacy students in the UAE have been reported yet. Rationalised by earlier studies that demonstrated the negative impacts of headache on individuals' performance and life quality [3,4] we focused on studying its prevalence among university students that are associated with health care and medical science disciplines. We report here on the epidemiology and associated factors of headache among pharmacy students of Al Ain University (AAU), United Arab Emirates (UAE), with view to assess the use of this study to design future health-treatment and educational programs in headache management hence, reducing the damage to both individuals and community.

METHODS

Cross-sectional descriptive study was conducted from June to July 2019 among pharmacy students of College of Pharmacy, Al Ain University (AAU), a private university in the United Arab Emirates (UAE). AAU which was originally based in Al Ain city, has also expanded its facilities by opening a second campus in Abu Dhabi- students from different semesters in both campuses altogether were included in the study. The researcher was trained to approach the students, introduced herself, and expressed the objectives and importance of the study. Ethical clearance was sought from AAU local ethics committee, in addition to verbal informed consent from the respondents. The questionnaire then was distributed to 473 students (total undergraduate pharmacy students in AAU).

The questionnaire was designed based on the International Headache Standards (IHS); following data were gathered through the structured self-administered questionnaire: demographic information, prevalence of headache, clinical presentation, impact of headache, and management of headache. The following were studied: the presence of any type of headache with its frequency, duration, intensity, treatment, as well as associated symptoms and triggers. Study inclusion criteria were: (1) being the student of College of Pharmacy, AAU and (2) agreed to participate in the study, while the exclusion criterion was: (1) incomplete response to all questionnaire items.

Statistical analysis was performed using the IBM SPSS Statistics version 22 software (SPSS Inc., Chicago, IL, USA, 2013). Descriptive statistics were used to generate frequencies, means, and standard deviations for evaluation. Chi-square test and independent t-test were used to determine statistical significance, where the p values were set at 0.05 unless stated otherwise.

RESULTS

From demographical study, a total of 213 students responded to the questionnaire and participated in the study (45.0% response rate), with around 176 participants were reported to have had headache (82.6%) in the last 12 months (Table 1). Most of the sufferers were females valued of around 152 (86.4%) as compared to only 24 males (13.6%), with 96% of them were single and only 4% were married. The

youngest group of students suffered from headache were aged less than 20 (40.9%) and it decreased inversely proportional to the age.

The sufferers were also grouped based on their cumulative grade point average (CGPA): 43 participants (24.4%) with 3.6-4.0, 63 sufferers (35.8 %) with 3.0-3.5, 69 students (39.2%) were found with 1.0-2.9, and only one respondent (0.6%) with below than 1.0. The study demonstrated that the frequency of sufferers increased with an increase of level of study with year four students were found to suffer the most from headache with 65 cases (36.9%). Most of the respondents (66.5%) did not have family history of headache and the duration of study per day was in the level of four hours, with 106 (60.2%) of them showed last-minute study habit when approaching examinations.

The frequency of the attacks was every day in 9.7% of the participants, once a week in 14.2%, two to four times a week in 17.6%, once a month in 17.6%, once in less than three months in 13.6%, and in 25.6% the frequency was variable (Table 2). The duration of headache in 28.4% cases was found to be in minutes, 60.2% of them reported to last within hours, and 11.4% cases lasted for days. Even though majority of the respondents were not diagnosed yet (72.7%), however migraine appeared as the most common type of headache to be diagnosed with (10.2%), followed by tension type headache (9.7%), and sinus (3.4%). An equal number of cases was reported for unilateral and bilateral headaches (42.6%), with 21.6 % reported as pulsating, 12.5% as pressing, 60.2% as stabbing and in the rest as vague.

The most common associated triggering factors (Table 3) reported by the sufferers include stress and anxiety (68.8%), examinations (63.6%), exposure to intense and disturbing light, smell, and noise (30.1%), as well as smoking (13%). The role of caffeine, food, and allergies in triggering the headache was found to be less than 10%. In case of women, 27.3% of them believed menstruation would trigger the attacks. Sleep pattern, either it is lack of sleep (49.4%) or oversleeping (21%), has been reported in headache sufferers. Studying, reading, and watching TV or monitor for long hours contributed to headache cases among the students with value of 53.4%, 19.3%, and 25% respectively. Around 43 students (27.3%) had undefined headache-triggering factors than the ones listed in the questionnaire.

Results from table 4 reported that 103 (58.5%) of sufferers consumed analgesics to alleviate the pain with 78 (32.3%) of them did not seek for advice from healthcare professionals and depend only on their own knowledge. Only 24.8% of them had visited physicians or pharmacists, while the rest referred to family members (19%), books (0.8%), social media (1.7%), and friends (4.6%). Among students who had consumed drug for the treatment, 124 (48.2%) used paracetamol,

Table 1: Distribution of samples based on demographic variables (n = 213; p < 0.05).

		Headache, n (%)	No headache, n (%)	*P* value
Sex	Male	24 (13.6)	16 (43.2)	0.00
	Female	152 (86.4)	21 (56.8)	
Marital status	Single	169 (96.0)	33 (89.2)	0.09
	Married	7 (4.0)	4 (10.8)	
Age group (years)	< 20	72 (40.9)	17 (45.9)	0.48
	20-29	60 (34.1)	10 (27.0)	
	30-39	41 (23.3)	8 (21.6)	
	≥ 40	3 (1.7)	2 (5.4)	
Cumulative Grade Point Average (CGPA)	3.6-4.0	43 (24.4)	2 (5.4)	0.00
	3.0- 3.5	63 (35.8)	5 (13.5)	
	1.0-2.9	69 (39.2)	25 (67.6)	
	< 1.0	1 (0.6)	5 (13.5)	
Years of study	1	21 (11.9)	11 (29.7)	0.03
	2	42 (23.8)	5 (13.5)	
	3	48 (27.3)	10 (27.0)	
	4	65 (36.9)	11 (29.7)	
Family history	Yes	59 (33.5)	27 (73.0)	0.00
	No	117 (66.5)	10 (27.0)	
Study duration per day	Mean ± SD	4.2 ± 0.7	2.3 ± 0.2	0.00
Study habit	Continuously every day	70 (39.8)	13	0.60
	Few days before examinations	106 (60.2)	24	

Table 2: Clinical characteristics of samples with headache (n = 176).

Characteristic		Frequency (%)
Duration of attack	Minutes	50 (28.4)
	Hours	106 (60.2)
	Days	20 (11.4)
Frequency of attack	Every day	17 (9.7)
	Once a week	25 (14.2)
	2-4 times a week	34 (19.3)
	Once a month	31 (17.6)
	Once in less than three months	24 (13.6)
	Others	45 (25.6)
Type of headache	Migraine	18 (10.2)
	Tension type headache	17 (9.7)
	Sinus headache	6 (3.4)
	Not diagnosed yet	128 (72.7)
	Others	7 (4)
Quality of pain	Pulsating	38 (21.6)
	Pressing	22 (12.5)
	Stabbing	106 (60.2)
	Others	10 (5.7)
Site of pain	Unilateral	75 (42.6)
	Bilateral	75 (42.6)
	Others	26 (14.8)
Intensity of pain	Mean ± SD	4.5 ± 0.4

Table 3: Triggering factors of headache among samples (n = 176).

Factor	Frequency (%)
Stress and anxiety	121 (68.8)
Examinations	112 (63.6)
Studying for long hours	94 (53.4)
Lack of sleep	87 (49.4)
Working on computer for long hours	64 (36.4)
Intense light, smell, noise	53 (30.1)
Menstrual period	48 (27.3)
Watching TV for long period	44 (25.0)
Oversleeping	37 (21.0)
Reading for long period	34 (19.3)
Smoking	23 (13.0)
Lack of caffeine	17 (9.66)
Too much caffeine	15 (8.5)
Some types of food	10 (5.7)
Allergies	8 (4.5)
Others	48 (27.3)

Table 4: Behavioural management of headache among samples who had headache in the last 12 months (n = 176).

		Frequency (%)
Analgesic consumption	Yes	103 (58.5)
	If yes, who/what was the reference?	
	Physician	22 (9.1)
	Pharmacist	38 (15.7)
	Family members	46 (19.0)
	Books	2 (0.8)
	Social media	4 (1.7)
	Self-information	78 (32.3)
	Friends	11 (4.6)
	No	73 (41.5)
Type of analgesics	Paracetamol	124 (48.2)
	Ibuprofen	63 (24.5)
	Acetylsalicylic acid	24 (9.3)
	Diclofenac	20 (7.8)
	Naproxen	2 (0.8)
	Others	26 (10.1)
Frequency of using analgesics	Daily	9 (5.1)
	Weekly	44 (25.0)
	Monthly	77 (43.8)
	Yearly	46 (26.1)

63 (24.5%) used ibuprofen, 24 (9.3%) consumed acetylsalicylic acid, 20 (7.8%) used Diclofenac, two (0.8%) used naproxen, and the rest 26 (10.1%) used other common headache agents. 77 (43.8%) respondents mentioned that that they took analgesics every month, 44 (25%) consumed them every week, nine (5.1) used them every day, and the remaining 46 (26.1%) seldomly used them in a year. 146 (83%) cases were reported to increase the analgesic dose by continuous using after a certain period.

Among the sufferers, the questionnaire results also recorded that 101 (57.4%) of them reckoned that headache attacks might negatively affect social life in productivity and meeting other social obligations. 120 (68.2%) of the students also believed that headache symptoms would negatively impact academic life in terms of productivity, class absenteeism, focus during lecturers, examination marks, and daily studying hours.

DISCUSSION

This study was aimed at investigating the epidemiology of headache among students and the impacts on their life socially and educationally, as well as analysing analgesic usage behaviour of students with headache.

The study that was conducted on undergraduate pharmacy students of AAU showed that 82.6% of them suffered from headache in the last 12 months, which was closely equivalent to the results of other studies investigating in the same conflict of interest. In a research conducted on undergraduates in Southern Brazil [4], the prevalence of headache among students was slightly lower (74.5%), while the incidence of headache reported among medical undergraduates in North West Ethiopia and Iran were relatively comparable, with value of 81.11% and 81.53% respectively [3,6]. Slight discrepancy shown between studies perhaps is due to study population and methodological [12]. It also has been noticed that family history might contribute to headache prevalence due to genetic association [13].

It has been observed that an increase in the levels of study leads to more episodes of headache significantly among students with 65% cases were reported in year four students, 48% in year three, 42% in year two and merely 2% in year one students, as supported by a study done by Shahrakai, et al. [14] that indicated a significant relationship between years of study and migraine symptoms. This can perhaps be associated with more courses, assignments, and graduation projects that require higher thinking skills and ability in year four curriculum as compared to lower levels of study, leading to tension and stressful life that aggravates headache episodes of headache. Gender showed a significant impact towards headache prevalence with female students have recorded more cases than male with value of 86.4% and 13.6% respectively, as supported by other studies [15,16]. This is believed to be contributed by hormonal changes that happen especially during menstruation [17]. Moreover, McGregor, et al. [18] in their study discussed how level of oestrogen might affect migraine attacks whereby low level of oestrogen would increase migraine attacks while high level of oestrogen would give the opposite effect.

Surprisingly, students with lower CGPA (1.0-2.9) had the highest incidence of headache (96%) and the cases decreased with an increase in CGPA. This can be related to study habit, where 60.2% of them exhibited the habit of last-minute study in approaching their examinations, in which might lead to anxiety and stress, as well as lack of sleep. Students with better academic performance perhaps implemented a continuous-study habit where has benefitted them positively and reduced the possibility of headache attacks. Daily study duration showed that longer study hours can intensify headache, as supported by other study, [19] with the sufferers spent around four hours per day as compared to only two hours by the non-sufferers.

In this study, headache-aggravating factors such as stress, examinations, over study, lack of sleep, women menstruation, working on computers for too long, and exposure to intense light, smell and noise are among the most popular answers and were consistent with other studies [6,11,20]. A study done by Asadnia, et al. [21] reported that people with relatively less quality of sleep experienced more episodes of headache, in which can explain why oversleeping and too much caffeine appeared to be among the triggering factors of headache. Few responses have indicated that some types of food contributed to headache attacks, as supported by the results discussed by Zarea, et al. [3] that mentioned fish, caffeine, pepper, and fatty food as the potential headache-triggering factors. In another study, vitamin D has been reported to exhibit some potential in the treatment of headache attacks [22,23], therefore proper monitoring our daily food consumption and understanding the factors is essential to reduce the frequency and severity of the attack.

As shown from the results, 58.5% of the students consumed analgesics to ease the pain, however only 24.8% went to seek advice on proper management of the analgesics from physicians and pharmacists. Majority of the drug users (32.3%) preferred self-treatment and the remaining 42.1% sought advices from friends, family members, and social media, with only less than 1 % referred to books. With more than 75% of the drug users consumed analgesics on a monthly basis, this self-treatment habit and seeking for medical advices from non-healthcare professionals however might lead to untoward effects of the drugs. Several studies have reported that frequent and overuse of analgesics may cause dependency, withdrawal symptoms, and medication-overuse headache [24,25]. This perhaps can be related to the frequency of the headache attacks reported in this study where more than 60% suffered at least once in a month, in which may come from rebound headache due to over consumption

of analgesics. 41.5% of the sufferers did not consume analgesics to treat the headache rather they preferred to have adequate rest and fluid; this non-drug treatment was reported by Da Costa, et al. in their study [26]. Of all the analgesics, 48.2% commonly used paracetamol perhaps due to its wide availability and accessibility, similar with the data reported by Mehuys, et al. [10].

CONCLUSION

Our results demonstrate that headache is indeed a challenging health problem among students with high prevalence and low awareness among them to seek medical advice from the professionals-despite being associated with healthcare discipline, in which warrant further investigation into the professional management and preventive strategies of headache.

SIGNIFICANCE FOR PUBLIC HEALTH

Knowledge, awareness, and attitudes of pharmacy students towards health issue are crucial for public health because they are believed to play key role in educating people surrounding them regarding health issue, including headache management. We believe investigating the epidemiology and management of headache could provide useful insights into public health awareness among them, hence assisting in creating better health programmes to enhance life quality to individuals and community.

ACKNOWLEDGMENTS

The authors would like to thank Al Ain University, UAE, for supporting this study and the students for their cooperation.

REFERENCES

1. Le H, Tfelt-Hansen P, Skytthe A, Kyvik KO, Olesen J. Association between migraine, lifestyle and socioeconomic factors: A population-based cross-sectional study. J Headache Pain. 2011; 12: 157-172. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/21390550

2. Adoukonou T, Houinato D, Kankouan J, Makoutode M, Paraiso M, Tehindrazanarivelo A, et al. Migraine among university students in Cotonou (Benin). Headache. 2009; 49: 887-893. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/19389138

3. Zarea K, Rahmani M, Hassani F, Hakim A. Epidemiology and associated factors of migraine headache among iranian medical students: A descriptive-analytical study. Clin Epidemiol Glob Health. 2018; 6: 109-114. http://bit.ly/38om9Qs

4. Falavigna A, Teles AR, Velho MC, Vedana VM, Silva RCD, Mazzocchin T, et al. Prevalence and impact of headache in undergraduate students in Southern Brazil. Arq Neuropsiquiatr. 2010; 68: 873-877. http://bit.ly/2OMoyfY

5. Demirkirkan MK, Ellidokuz H, Boluk A. Prevalence and clinical characteristics of migraine in university students in Turkey. Tohoku J Exp Med. 2006; 208: 87-92. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/16340178

6. Birru EM, Abay Z, Abdelwuhab M, Basazn A, Sirak B, Teni FS. Management of headache and associated factors among undergraduate medicine and health science students of University of Gondar, North West Ethiopia. J Headache Pain. 2016; 17: 56. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/27216280/

7. Silberstein SD. Headache in clinical practice. Routledge; 2018. p. 296. http://bit.ly/3bw9Nrx

8. Steiner TJ, Birbeck GL, Jensen RH, Katsarava Z, Stovner LJ, Martelletti P. Headache disorders are third cause of disability worldwide. J Headache Pain. 2015; 16: 58. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/26109437

9. Mitsikostas DD, Gatzonis S, Thomas A, Kalfakis N, Llias A, Papageoergiou C. An epidemiological study of headaches among medical students in Athens. Headache. 1996; 36: 561-564. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/8916565

10. Mehuys E, Paemeleire K, Van Hees T, Christiaens T, Van Bortel LM, Van Tongelen I, et al. Self-medication of regular headache: a community pharmacy-based survey. Eur J Neurol. 2012; 19: 1093-1099. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/22360745

11. Nandha R, Chhabra MK. Prevalence and clinical characteristics of headache in dental students of a tertiary care teaching dental hospital in Northern India. Int J Basic Clin Pharmacol. 2013; 2: 51-55. http://bit.ly/2SFXosi

12. Ferri-de-Barros JE, Alencar MJd, Berchielli LF, Castelhano Junior LC. Headache among medical and psychology students. Arq Neuropsiquiatr. 2011; 69: 502-508. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/21755130

13. Rainero I, Rubino E, Paemeleire K, Gai A, Vacca A, De Martino P, et al. Genes and primary headaches: Discovering new potential therapeutic targets. J Headache Pain. 2013; 14: 61. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/23848401/

14. Shahrakai MR, Mirshekari H, Ghanbari AT, Shahraki AR, Shahraki E. Prevalence of migraine among medical students in Zahedan Faculty of Medicine (Southeast of Iran). Basic Clin Neurosci. 2011; 2: 20-25. http://bit.ly/2vroT0O

15. Straube A, Pfaffenrath V, Ladwig KH, Meisinger C, Hoffmann W, Fendrich K, et al. Prevalence of chronic migraine and medication overuse headache in Germany-the German DMKG headache study. Cephalalgia. 2010; 30: 207-213. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/19489879

16. Domingues RB, Aquino CCH, Santos JG, Silva AL, Kuster GW. Prevalence and impact of headache and migraine among Pomeranians in Espirito Santo, Brazil. Arq Neuropsiquiatr. 2006; 64: 954-957. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/17221003

17. Silberstein SD. Hormone-related headache. Med Clin North Am. 2001; 85: 1017-1035. http://bit.ly/31MRJoB

18. MacGregor EA, Frith A, Ellis J, Aspinall L, Hackshaw A. Incidence of migraine relative to menstrual cycle phases of rising and falling estrogen. Neurology. 2006; 67: 2154-2158. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/16971700

19. AytaÇOĞLu H, Aynur Ö, KöstekÇI İ, TaŞDelen B, Öksüz N, Toros F. The Effects of daily variables on primary headache disorders in high-school children: A proposal for a cut-off value for study/leisure time regarding headache types. J Neurol Sci Turk. 2011; 28: 453-464.

20. Al-Hashel JY, Ahmed SF, Alroughani R, Goadsby PJ. Migraine among medical students in Kuwait University. J Headache Pain. 2014; 15: 26. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/24886258/

21. Asadnia S, Sepehrianazar F, Aghdam AM, Saadatmand S. Comparison of sleep quality and migraine headaches in people with proper and improper and poor sleep. Urmia Med J. 2013; 23: 799-806. http://bit.ly/2ShNYV8

22. Thys-Jacobs S. Alleviation of migraines with therapeutic vitamin D and calcium. Headache. 1994; 34: 590-592. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/7843955

23. Buettner C, Nir RR, Bertisch SM, Bernstein C, Schain A, Mittleman MA, et al. Simvastatin and vitamin D for migraine prevention: A randomized, controlled trial. Ann Neurol. 2015; 78: 970-981. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/26418341

24. Diener H-C, Limmroth V. Medication-overuse headache: A worldwide problem. Lancet Neurol. 2004; 3: 475-483. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/15261608

25. Dyb G, Holmen TL, Zwart JA. Analgesic overuse among adolescents with headache: The Head-HUNT-youth study. Neurology. 2006; 66: 198-201. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/16434653

26. Da Costa MZG, Soares CB, Heinisch LMM, Heinisch RH. Frequency of headache in the medical students of Santa Catarina's Federal University. Headache. 2000; 40: 740-744. **PubMed:** https://www.ncbi.nlm.nih.gov/pubmed/11091293