

Clinical science

Use of over-the-counter supplements, sleep aids and analgesic medicines in rheumatology: results of a cross-sectional survey

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Abstract

Objectives: Pain, fatigue and sleep disturbances are common symptoms in patients with rheumatic and musculoskeletal diseases (RMDs) that may prompt the use of over-the-counter (OTC) supplements, sleep aids and analgesics as self-management strategies. This study evaluated the prevalence of OTC supplements, sleep aids and pain relievers and the financial burden associated with their use in rheumatology.

Methods: A web-based survey developed with patients was administered in rheumatology clinics in an English hospital. Participants shared demographic information and detailed their use of OTC supplements, sleep aids and pain relief in the past week. The data were analysed using descriptive statistics and logistic regression models to identify influencing factors.

Results: A total of 876 people consented to participate in the survey. More than half of patients (54.5%) reported daily supplement intake, typically spending £10/month (interquartile range 5–20), ranging up to £200/month. The most commonly administered supplements were vitamin D, multivitamins, vitamin C, vitamin B/B complex and omega-3/6 supplements, with multiple overlaps. Prescription, OTC or non-prescription pain relief use was reported by 82% of respondents, with sleep aids being used by 13%. Of the 327 patients who took NSAIDs, 165 (50.4%) also reported taking OTC supplements, while among the 131 patients using opioids (20.5%), 66 (50.3%) reported supplement use, some of which have documented interactions.

Conclusion: The use of OTC supplements, pain relief and sleep aids is common in patients with RMDs. Healthcare professionals should be encouraged to proactively ask about these during consultations, especially from a drug safety perspective, but also to provide timely, reliable advice about such strategies that may be sought by patients.

Lay Summary

What does this mean for patients?

Living with musculoskeletal conditions often means coping with persistent pain, fatigue and sleep disturbances. To manage these symptoms, many people turn to over-the-counter (OTC) medications such as supplements, sleep aids and pain relievers, in addition to their prescribed medications. But how common is this practice and what are the implications for patients and healthcare providers? To understand this, we surveyed patients attending rheumatology clinics. The survey was designed with input from patients and asked participants about their use of these OTC products over the past week. The results revealed that using OTC products to manage symptoms is widespread. More than half of the patients surveyed reported take supplements daily, with vitamin D, multivitamins, vitamin C, B vitamins, omega-3/6 and turmeric being the most popular. People often took multiple supplements with a financial cost up to £200/week. More than 80% of patients also used some form of pain relief, whether it was prescription, OTC/internet or borrowed from a family member. Concerningly, a considerable number of patients combined OTC supplements with prescription pain medications, including anti-inflammatories and opioids, despite potential interactions. This study highlights the importance of open communication between patients and healthcare providers about OTC product use. Healthcare professionals should proactively ask patients about these products during consultations, not only to ensure safety and manage potential drug interactions, but also to provide evidence-based advice and support patients in making informed decisions about their health.

Keywords: over the counter, supplements, sleep aids, analgesics, opioids, opiates, vitamins, minerals, survey, patient-reported health data.

Received: 21 August 2024. Accepted: 25 September 2024

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Key messages

- More than half of rheumatology patients surveyed reported taking an over-the-counter (OTC) supplement, with one in three patients using two or more supplements and one in five using five or more supplements daily.
- Prescription, OTC or non-prescription pain relief was used routinely by 82% of rheumatology patients, with sleep aids being used by 13%.
- Patients were often on overlapping supplements and OTC medications, some of which are known to interact or would increase their recommended daily allowance substantially.

Introduction

Over the past few decades, the consumption of supplements has surged, with the global industry now valued at US\$300 billion [1]. People turn to supplements for various reasons, with one of the leading motivations being the desire to maintain healthy joints and prevent or ease arthritis [2]. The widespread interest in over-the-counter (OTC) supplements and medicines in rheumatology is to be expected, especially since OA and other common non-inflammatory musculoskeletal (MSK) disorders currently lack approved DMARDs [3–5]. The prevalence of such medicines in these conditions is unknown. Rheumatic and musculoskeletal diseases (RMDs) considerably impair people's quality of life and their ability to perform activities of daily living [6]. Pain can be a predominant issue for those affected by RMDs, which can serve as a catalyst for patients to actively seek solutions to mitigate such symptoms and improve their daily functioning [7].

Alongside pain, poor sleep quality and fatigue are prevalent among rheumatology patients, which may not always be effectively treated following treatment of disease activity [8]. Understandably, patients with RMDs may seek potential alternatives, either OTC or through supplement use to self-manage their symptoms [9, 10]. This may include sleep aids and additional pain relievers available OTC to alleviate their symptoms [11], even more so compared with the general population. While supplements are often perceived as harmless because they can be obtained without a prescription, they are an unregulated industry and may still pose potential adverse effects or drug interactions [10].

The available analgesic options for RMDs pose their own set of issues. NSAIDs are often less suitable for long-term use in individuals >65 years of age, while opioids have been associated with a range of harms [12]. In 2021, the National Institute for Health and Care Excellence in the UK made changes by removing the recommendation to use NSAIDs and opioids for chronic pain management [13]. Non-pharmacological options, such as exercise programs and orthoses, which have good efficacy in clinical trials, have variable adherence among patients, and psychological support or acupuncture may be challenging for patients to access. In the latest EULAR guidelines for hand OA, analgesics such as NSAIDs are recommended for a limited duration only, while placebo-controlled trials of nutraceuticals are on the research agenda but not currently recommended [11].

The cumulative financial expense of OTC supplements, pain relievers and sleep supplements is challenging due to varying prices, brands and personal usage. Persistent pain associated with MSK conditions often impacts those in more deprived populations, where such diseases tend to be more prevalent [14]. The cost of OTC supplements for managing MSK conditions can represent a substantial expense in the limited monthly budgets of those from lower socio-economic backgrounds, exacerbating health inequalities. Sources of

supplements and non-prescription medications have now extended to buying over the internet, including through social media channels, which have also become catalysts for wellness trends. There is a lack of research about the frequency of use; types of supplements, sleep aids and pain relief; cost and the characteristics of patients who administer them within rheumatology. Typically, OTC supplements, sleep aids and pain relievers are not consistently recorded or are poorly documented within primary or secondary care electronic health records, underscoring the need to obtain this information directly from patients.

The aims of this study were to evaluate the prevalence of use of OTC supplements, sleep aids and pain reliever in patients with rheumatological conditions and to quantify and describe the subtypes, financial costs and individual factors associated with each in patients attending rheumatology clinics.

Methods**Survey design and administration**

A draft web-based patient survey was initially developed collaboratively with two academic consultant rheumatologists, a health informatician and a health psychologist. A patient advisory team ($n=4$) was recruited via advertisements posted on social media and the university web pages and mailing lists. The final advisory team providing feedback on the draft survey included one occupational therapist and three patients with (collectively) OA, RA and PsA. Two participants identified as Asian and two as White Caucasian. This diverse team provided valuable input on prioritizing essential survey questions, identifying elements that could be excluded to reduce patient burden and offering suggestions for enhancing patient usability. After incorporating this feedback, the survey was finalized and designed using Qualtrics software (version October 2022; Qualtrics, Provo, UT, USA) [15]. The final version is available in the [Supplementary Material](#), available at *Rheumatology Advances in Practice* online.

Patients attending the rheumatology department at Salford Royal Hospital, a large foundation trust in the northwest of England, were invited to participate. The survey web link was shared by their consultants with unselected rheumatology patients using an invitation letter and a printed QR code and, through text messages using the DrDoctor software (DrDoctor, London, UK), a patient engagement platform was used to send reminders regarding hospital appointments. The data collection period spanned from 3 October 2022 to 21 March 2024.

Patients were required to meet specific criteria to participate in the survey, including being an ≥ 18 years of age, diagnosed with an MSK condition, having had a rheumatology outpatient appointment at the hospital and being under the care of the Salford Royal rheumatology team. Additionally,

they needed access to an internet-connected device and were able to read and understand English independently or with assistance from a caregiver or relative. Prior to answering the survey, informed electronic consent was obtained.

Patients were asked to complete questions on their demographics and OTC supplement, sleep aid and pain relief use in the last week. For analgesics, information on prescription, OTC and non-prescription use was collected. Non-prescription use was defined in the survey as those medicines borrowed from a family member or purchased over the internet. Patients could select to complete one or multiple sections depending on what was relevant. It was an adaptive questionnaire, meaning more detailed questions were enabled if someone stated they had taken a particular treatment. The study received ethics approval from the UK Health Research Authority (REC reference: 306827).

Analysis

Data from the Qualtrics survey were exported to R version 4.2.1 (R Foundation for Statistical Computing, Vienna,

Austria) for analysis and visualization. Detailed descriptive and summary statistics were performed. Patient-reported partial postcodes were used to derive Townsend scores, correlating with UK census data to indicate levels of deprivation—a higher score signifying greater deprivation (<https://statistics.ukdataservice.ac.uk/dataset/2011-uk-townsend-deprivation-scores>). Participants were then grouped into quintiles based on these Townsend scores [16]. Logistic regression analysis, adjusted for age and sex, assessed factors such as ethnicity, MSK conditions and comorbidities associated with individuals' use of OTC supplements, sleep aids and pain relievers.

Results

Of the 876 individuals who consented to participate in the survey, 785 completed in one or more of the relevant sections (Supplementary Fig. S1, available at *Rheumatology Advances in Practice* online). Of the people who completed the survey, 716 (91.2%) individuals reported using at least one of the

Table 1. Baseline characteristics of patients who completed questions on OTC supplement use

Characteristics	All (N = 710)	Yes (n = 387)	No (n = 323)
Age, years, n (%)			
Mean (s.d.)	58.3 (14.5)	58.0 (14.7)	58.7 (14.2)
18–39	93 (13.1)	52 (13.4)	41 (12.2)
40–54	174 (24.5)	97 (25.0)	77 (23.8)
55–69	271 (38.1)	140 (36.1)	131 (40.6)
≥70	172 (24.1)	98 (25.5)	74 (22.9)
Gender, n (%)			
Female	521 (73.4)	275 (71.1)	246 (76.2)
Male	185 (26.0)	109 (28.1)	76 (23.5)
Other	NA	NA	NA
Ethnicity			
White British	668 (94.0)	362 (93.7)	306 (94.7)
Other/Mixed ethnic groups	25 (3.5)	17 (3.9)	8 (2.1)
Asian/Asian British	11 (1.5)	5 (1.4)	6 (1.8)
Black/African/Caribbean/Black British	6 (1.0)	3 (0.8)	3 (1.2)
Diagnoses, n (%)			
MSK conditions			
Osteoarthritis	233 (32.8)	131 (33.7)	102 (31.7)
RA	222 (32.1)	124 (32.1)	98 (32.0)
FM/chronic widespread pain	171 (24.1)	96 (24.9)	75 (23.2)
Osteoporosis	90 (12.8)	41 (10.6)	49 (15.4)
PsA	81 (11.5)	39 (10.1)	42 (13.2)
Other inflammatory condition	63 (8.9)	37 (9.6)	26 (8.2)
axSpA	55 (7.8)	28 (7.3)	27 (8.5)
Myositis	47 (6.7)	22 (5.7)	25 (7.8)
Comorbidities			
Other health conditions	234 (32.9)	131 (33.8)	101 (31.2)
Anxiety	190 (26.7)	105 (27.1)	83 (25.6)
Depression	153 (21.5)	71 (18.3)	81 (25.0)
Gastrointestinal disease	93 (13.0)	46 (11.8)	47 (14.5)
Heart disease	69 (9.7)	33 (8.5)	36 (11.1)
Systemic sclerosis	62 (8.7)	35 (9.0)	27 (8.3)
Previous cancer	48 (6.7)	28 (7.2)	20 (6.1)
Sjogren's syndrome	47 (6.6)	25 (6.4)	22 (6.8)
Townsend deprivation scores (quintiles), n (%)			
1 (least deprived)	105 (14.7)	51 (13.1)	54 (16.7)
2	61 (8.7)	32 (8.3)	29 (9.1)
3	124 (17.6)	74 (19.2)	50 (15.7)
4	109 (15.5)	54 (14.0)	55 (17.2)
5 (most deprived)	311 (44.1)	176 (45.4)	135 (41.7)

NA: not disclosed, as may be classed as sensitive information.

Some participants reported more than one diagnosis, including the MSK diseases above and the chronic diseases listed in the questionnaire. Other health conditions (participants asked to specify) include diabetes type 1 or 2, inflammatory bowel disease, chronic obstructive airway disease, asthma, chronic kidney disease, Crohn's disease, other chronic lung conditions, hypertension and liver disease. Please note that due to missing values, some columns may not add up to the total.

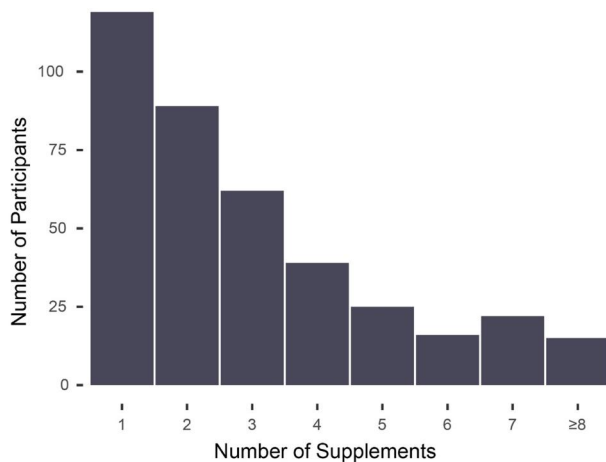


Figure 1. Distribution of the number of OTC supplements used by rheumatology patients

following: supplements, pain relievers or sleep aids. Within this group, 55 (7.0%) respondents indicated that they used all three types of interventions.

OTC supplements

In total, 710 patients completed questions on OTC supplement use. Of those, 521 (73%) were female, with a mean age of 58 years (s.d. 14.5) (Table 1). Most participants self-identified as White British [$n=668$ (94.3%)], with smaller proportions of Asian/Asian British [$n=11$ (1.5%)], African/Caribbean [$n=6$ (1.0%)] and other/mixed/multiple ethnic groups [$n=25$ (3.5%)]. OA and RA were the most common MSK conditions in 233 (32%) and 226 (32%) patients, respectively, followed by FM in 171 (24%) (see Table 1). Around two-thirds of respondents [$n=460$ (64%)] also indicated having one or more long-term health conditions, and 221 (31%) indicated having two or more multiple long-term health conditions.

The majority of patients surveyed [$n=387$ (54.5%)] took one or more supplements daily and 265 (37.3%) reported the use of two or more supplements daily. The median number of supplements taken was 2 [interquartile range (IQR) 1–4], ranging from 1 to 12 (Fig. 1). Of the people who said yes to taking supplements, almost one-fifth of patients [$n=75$ (19.3%)] used five or more different types of supplements daily. The most common supplements used among patients were vitamin D [$n=255$ (66%)], multivitamins [$n=126$ (32%)], vitamin C [$n=82$ (22%)], vitamin B [$n=75$ (19.4%)], calcium [$n=71$ (18.4%)], omega-3/-6 [$n=70$ (18.1%)], turmeric [$n=64$ (16.4%)], magnesium [$n=62$ (16.1%)], zinc [$n=43$ (11.1%)] and glucosamine [$n=38$ (9.8%)] (Fig. 2).

In people taking supplements, there was a large overlap between different supplements. Several individuals took an additional supplement alongside a daily multivitamin: 63 (16.2%) took additional vitamin D tablets, 26 (3.7%) took omega-3/-6, 24 (3.4%) took calcium, 19 (4.9%) took vitamin B and 19 (4.9%) took vitamin C (Fig. 3). The five most common combinations of overlap are quantified in Supplementary Fig. S2, available at *Rheumatology Advances in Practice* online. There were also large overlaps between vitamin D and C [$n=66$ (17.0%)], vitamin D and calcium [$n=65$ (16.7%)], vitamin D

and a multivitamin [$n=63$ (16.2%)] and vitamin D and B [$n=62$ (16.0%)] (Fig. 3).

Sleep aids

Of the people who participated, 719 (82%) respondents completed questions on sleep aid use (Supplementary Table S1, available at *Rheumatology Advances in Practice* online). Their demographics were similar to the respondents to the supplement questions, 529 (73%) were female, with a mean age of 58.3 years (s.d. 14.3). Of the 719 respondents, 95 (13%) used sleep aids. Among the sleep aid users, 37 (38.9%) had been diagnosed with OA and 34 (35.1%) had FM. Furthermore, 35 (37%) of the respondents reported having anxiety and depression (Supplementary Table S1, available at *Rheumatology Advances in Practice* online). Of the people on sleep aids, 31 (32%) reported getting them by prescription, 24 (25.2%) by non-prescription, 14 (14.7%) OTC and 4 (4.2%) by a combination of sources (Supplementary Fig. S3, available at *Rheumatology Advances in Practice* online). Additionally, 18 (19%) of the sleep aid users reported taking antihistamine/Benadryl by prescription. Also, 48 (51%) used CBD oil or similar products. The survey also showed that 53 (57%) of the respondents cited pain as the most common reason for taking CBD products.

Pain relievers

Of the participants who consented, 779 (88%) completed questions on the use of pain relievers. Of 779 individuals who experienced pain in the last week, 639 (82%) used some form of pain reliever, either prescription or non-prescription drugs such as paracetamol, NSAIDs or opioids (Supplementary Table S1, available at *Rheumatology Advances in Practice* online).

Non-opioids

Of those who used pain relievers, 470 (73%) reported using paracetamol, 327 (51.1%) reported using NSAIDs, 186 (29%) reported using ibuprofen, 86 (13%) reported using naproxen and 30 (4.6%) reported using diclofenac (Fig. 4). Additionally, 130 (20.5%) respondents reported using ibuprofen OTC, 25 (3.9%) obtained it from non-prescription sources and 14 (2.2%) received it by prescription. For diclofenac, 21 (3.3%) respondents were by prescription, 5 (0.8%) obtained it from non-prescription sources and 4 (0.6%) bought it OTC.

Overlap between NSAIDs and supplements

Of the 639 respondents who took pain relievers, 311 (48.6%) reported taking pain relievers and supplements. Of the 327 individuals who took NSAIDs, 165 (50.4%) also reported taking supplements. Among the people who reported taking ibuprofen, 70 (37.6%) also reported taking vitamin D, followed by vitamin B [$n=26$ (13.9%)], multivitamins [$n=33$ (17.7%)] and turmeric [$n=21$ (11.2%)]. Similarly, of the people who reported taking naproxen, 36 (41.8%) also reported taking vitamin D, followed by vitamin B [$n=9$ (10.4%)], multivitamin [$n=14$ (16.2%)] and turmeric [$n=10$ (11.6%)] (Table 2).

Opioids

A total of 131 (20.5%) respondents took opioids, of whom 80 (12.5%) reported taking codeine and 43 (6.7%) reported taking co-codamol as their most frequently used opioid pain reliever by prescription. This was followed by tramadol

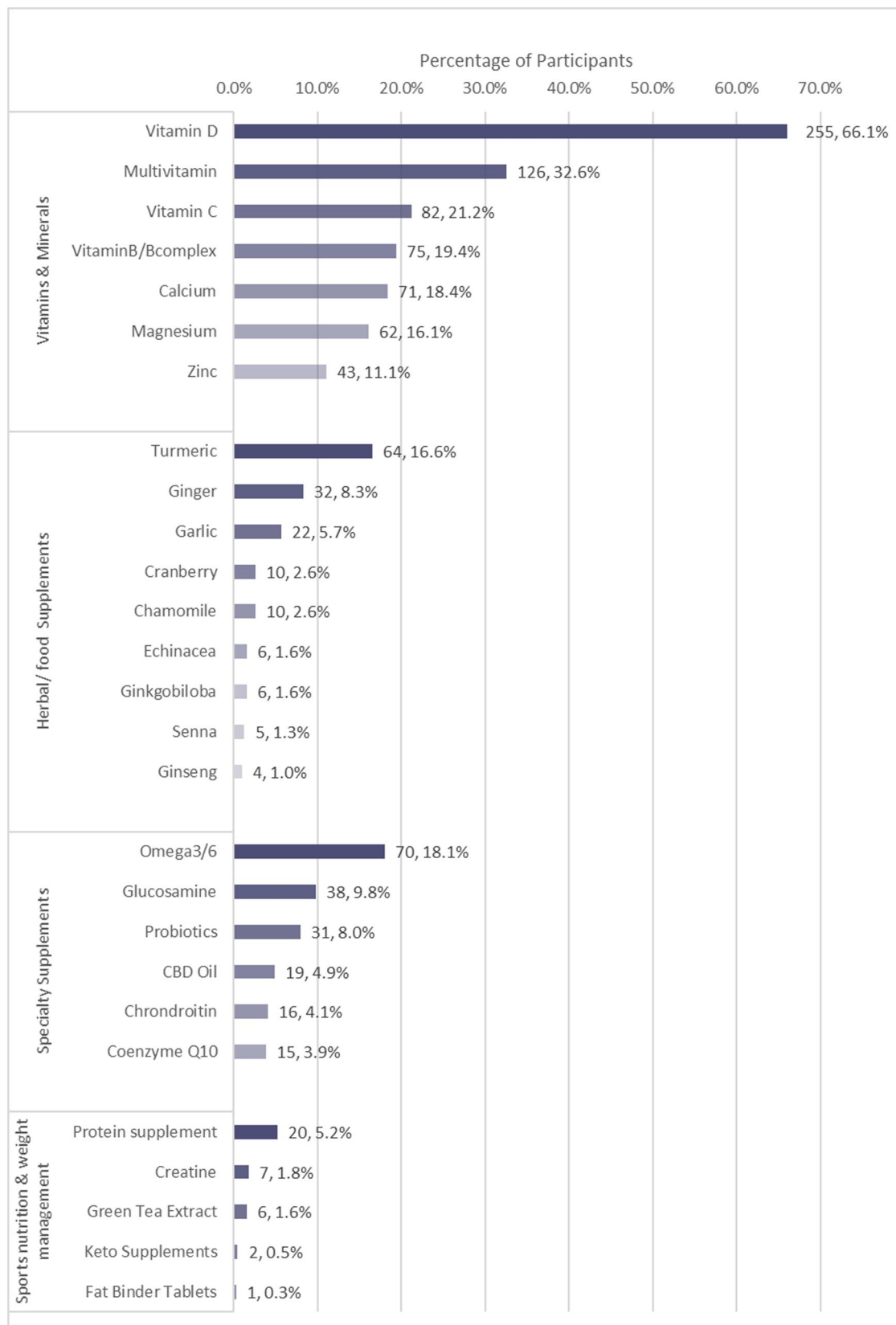


Figure 2. Distribution of OTC supplements used by rheumatology patients by type and specific supplements

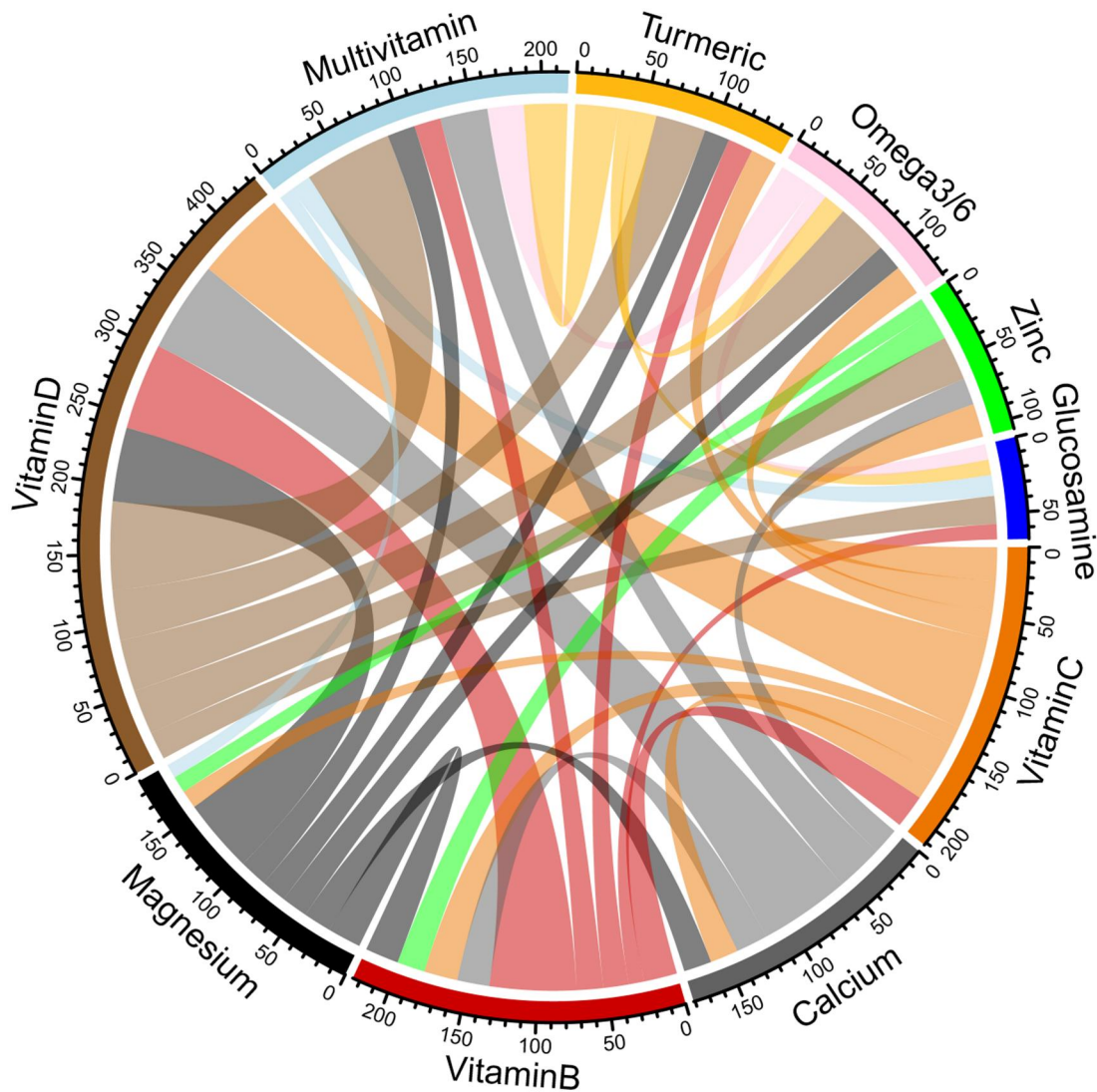


Figure 3. A chord diagram displaying the most common overlaps between the top 10 supplements. The diameter of the chord diagram is divided into groups of the 10 most common supplements, where the length of each arc is proportional to the total overlap count for each supplement. The count around the outer rim of the chord provides the overall count of supplements per group. Based on the diagram, vitamin D has the highest overlap count overall, followed by multivitamins, vitamin C and vitamin B. The thickness of the chord between supplements represents the number of participants who use both supplements. Thicker chords indicate higher numbers of participants using those supplements

[$n = 25$ (3.9%)] (as shown Fig. 4). Among the opioid users, 10 (1.5%) reported acquiring them from non-prescription sources. Of the individuals who used co-codamol, 37 (5.8%) obtained it by prescription, while a small proportion, $n = 4$ (0.6%) and $n = 2$ (0.3%), acquired it through non-prescription and OTC routes, respectively.

Overlap between opioids and supplements

Of the 131 (20.5%) people on opioids, 66 (50.3%) also reported taking supplements, followed by 62 (47%) taking vitamin and mineral supplements and 16 (12%) taking herbal or food supplements (Table 2).

Cost

The total median cost was £15/month (IQR 6–30), with a mean value of £24.80/month. Excluding prescribed pain-relieving medications, the median cost for OTC medications, sleep aids, CBD products and supplements was £10/month (IQR 5–20), with a mean value of £19.53/month. The costs for OTC

medications, sleep aids, CBD products and supplements ranged from £1/month to £200/month (Supplementary Fig. S4, available at *Rheumatology Advances in Practice* online).

Factors associated with taking OTC supplements, sleep aids and pain relievers

In the logistic regression model, after adjusting for age and sex, no factors were found to be significantly associated with using OTC supplements. Patients diagnosed with axial spondylarthritis (axSpA) and FM had a higher odds ratio (OR) of using sleep aids compared with those without these conditions [OR 2.32 (95% CI 1.13, 4.52) and 1.81 (95% CI 1.10, 2.97), respectively] (Supplementary Tables S2A and S2B, available at *Rheumatology Advances in Practice* online). Individuals diagnosed with RA, OA and FM exhibited higher odds of using pain reliever medications compared with those without these conditions. The adjusted ORs for RA, OA and FM were found to be 1.58 (95% CI 1.04, 2.44), 3.34 (95%

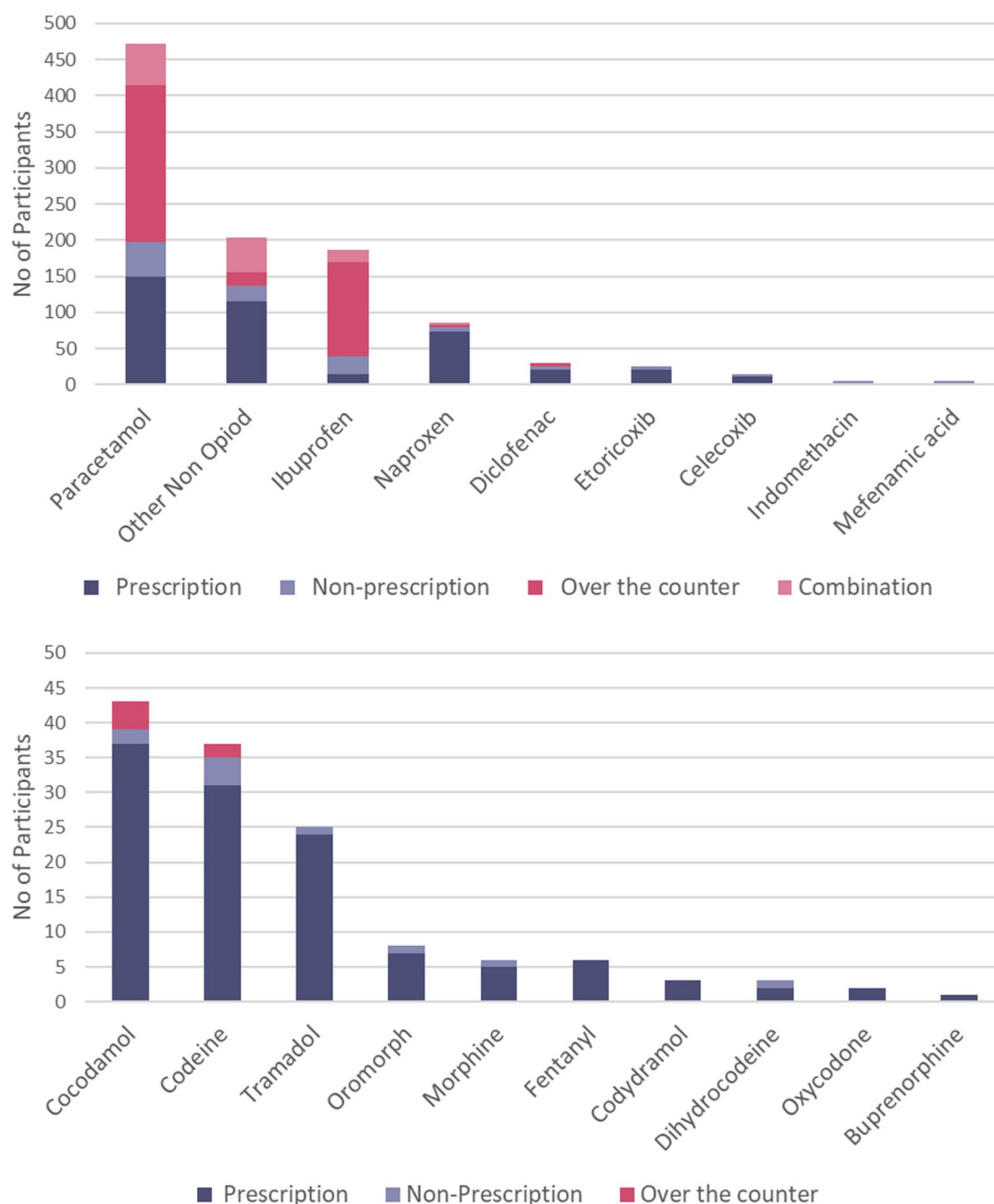


Figure 4. Types of pain relievers reported by rheumatology patients. **(A)** Non-opioid pain relievers. **(B)** Opioid pain relievers. Non-prescription use was defined in the survey as those medicines borrowed from a family member or purchased over the internet

CI 2.03, 5.75) and 3.44 (95% CI 1.95, 6.48), respectively (Supplementary Table S2B, available at *Rheumatology Advances in Practice* online).

Discussion

Our survey results revealed that OTC supplement use is frequent, with >50% of rheumatology patients taking supplements. At least one in three patients was on two or more supplements and one in five took five or more supplements daily. Noting that most respondents were from more socially deprived areas (Table 1), the median cost per patient was £10/month (IQR 5–20), ranging up to £200/month. The most common supplements used among patients were

vitamin D, multivitamins, vitamin C, vitamin B/B complex, omega-3/6 supplements and calcium, followed by turmeric, magnesium, zinc and glucosamine. Additionally, prescription, OTC or non-prescription pain relief was used by up to 82% of respondents, with sleep aids being used by 13%.

While limited data regarding supplement use across Europe exists, a previous national survey in the USA found that >70% of adults ≥ 71 years of age used supplements [17]. More women were found to use supplements [18] and their use in the USA has been associated with higher educational and socio-economic status [19]. In our study, we found that the highest proportion, 61%, of supplement users were between the ages of 40 and 69, with a lower proportion, 25%, >70 years of age reporting supplement use. Socio-economic

Table 2. Overlap between the most common supplements and opioids and NSAIDs

Supplements	NSAIDs													
	All (N = 131)	Co-codamol (n = 43)	Codeine (n = 37)	Tramadol (n = 25)	Oromorph (n = 8)	Morphine (n = 6)	Fentanyl (n = 6)	Dihydrocodeine (n = 3)	Codydramol (n = 3)	All (N = 327)	Ibuprofen (n = 186)	Naproxen (n = 86)	Didlofenac (n = 30)	Etoricoxib (n = 25)
Vitamin D	55 (42.0)	17 (39.5)	11 (29.7)	14 (56)	4 (50)	3 (50)	2 (33.3)	3 (100)	1 (33.3)	127 (38.8)	70 (37.6)	36 (41.8)	10 (33.3)	11 (44)
Glucosamine	3 (2.3)	3 (6.9)	—	—	—	—	—	—	—	21 (6.4)	11 (5.9)	8 (9.3)	2 (6.6)	—
Vitamin B/B complex	14 (10.7)	5 (11.6)	5 (13.5)	4 (16)	—	—	—	—	—	38 (11.6)	26 (13.9)	9 (10.4)	2 (6.6)	1 (4)
Multivitamin	29 (22.1)	13 (30.2)	5 (13.5)	5 (20)	2 (25)	1 (16.6)	2 (33.3)	1 (33.3)	—	56 (17.1)	33 (17.7)	14 (16.2)	6 (20)	3 (12)
Magnesium	17 (13.0)	5 (11.6)	3 (8.1)	5 (20)	—	1 (16.6)	—	2 (66.6)	1 (33.3)	43 (13.1)	26 (13.9)	10 (11.6)	4 (13.3)	3 (12)
Calcium	14 (10.7)	4 (9.3)	3 (8.1)	4 (16)	2 (25)	1 (16.6)	—	—	—	34 (10.4)	19 (10.2)	7 (8.1)	4 (13.3)	4 (16)
Vitamin C	17 (13.0)	2 (4.6)	8 (21.6)	4 (16)	1 (12.5)	1 (16.6)	—	1 (33.3)	—	45 (13.8)	28 (15.0)	13 (15.1)	3 (10)	1 (4)
Omega-3/6	4 (3.1)	2 (4.6)	1 (2.7)	—	—	1 (16.6)	—	—	—	13 (4.0)	7 (3.7)	5 (5.8)	1 (3.3)	—
Zinc	9 (6.9)	3 (6.9)	4 (10.8)	1 (4)	—	—	—	1 (33.3)	—	26 (8.0)	14 (7.5)	8 (9.3)	2 (6.6)	2 (8)
CBD oil	5 (3.8)	1 (2.3)	3 (8.1)	1 (4)	—	—	—	—	—	16 (4.9)	11 (5.9)	4 (4.6)	1 (3.3)	—
Chamomile	2 (1.5)	—	1 (2.7)	1 (4)	—	—	—	—	—	3 (0.9)	3 (1.6)	—	—	—
Turmeric	9 (6.9)	5 (11.6)	2 (5.4)	1 (4)	—	—	—	—	1 (33.3)	37 (11.3)	21 (11.2)	10 (11.6)	3 (10)	3 (12)
Ginkgo biloba	0 (0.0)	—	—	—	—	—	—	—	—	2 (0.6)	2 (1.07)	—	—	—
Garlic	4 (3.1)	—	1 (2.7)	1 (4)	1 (12.5)	—	1 (16.6)	—	—	8 (2.4)	6 (3.2)	1 (1.1)	—	1 (4)
Ginger	7 (5.3)	3 (6.9)	1 (2.7)	1 (4)	1 (12.5)	—	1 (16.6)	—	—	20 (6.1)	12 (6.4)	4 (4.6)	2 (6.6)	2 (8)
Echinacea	2 (1.5)	—	—	1 (4)	—	—	1 (16.6)	—	—	2 (0.6)	1 (0.5)	1 (1.1)	—	—

status was not significantly associated with supplement use, suggesting that its use continues to be popular across all groups.

In the last decade, there have been increasing trends in certain supplements (e.g. vitamin D, calcium, multivitamins, vitamin C and collagen), although the clinical efficacy of several of these remains controversial [20]. Patients may understandably request advice about the efficacy of supplementation from their rheumatology team and healthcare professionals, as they are often faced with conflicting information. Multivitamins remain a popular supplement choice in rheumatology patients. However, research based in the USA across >300 000 patients has demonstrated no long-term benefit of multivitamins or additional benefits on mortality risk [20]. Glucosamine continues to be used in rheumatology patients (10% of those reported supplement use). Its effectiveness in rheumatology, especially OA, has been debated for years. Several studies have investigated the efficacy of glucosamine in OA with mixed results. Currently there is no good evidence to support the use of glucosamine [21]. As per national guidance, vitamin D supplementation is advocated during winter months and throughout the year in those with risk factors [22]. Omega-3 supplementation has been reported to have a modest effect on tender and swollen joints in RA [23], with some potentially beneficial effects in reducing cardiovascular outcomes [24]. In the last few years, turmeric has been tested in different settings, including OA. More recent randomized controlled trials have demonstrated promise in reducing pain in knee OA compared with placebo [25], with a small number of RCTs reporting a benefit similar to that of NSAIDs [26].

There are several drug safety considerations with supplement use that may not be well known among patients, highlighting the importance of health professionals proactively asking about them during visits. The first is that the quality of supplements can be variable, given that they fall under the General Sales List within the legal classification of medicines [27]. Therefore they do not undergo the same safety, quality and efficacy reviews as pharmacological medicines and are not obligated to have warnings on labels. This has led to the recall of certain supplemental products due to concerns regarding toxicity following warnings by drug regulators [28]. The second is interactions between prescribed medications and other OTC drugs. For instance, curcumin, the active ingredient within turmeric, may increase drug levels of sulfasalazine and warfarin, leading to more adverse events [29]. Echinacea is known to affect the hepatic metabolism of certain prescribed medications, such as paracetamol [30]. Both turmeric and echinacea use were commonly reported among patients surveyed. Opioids may increase the risk of respiratory depression when used with other sedative herbal supplements such as chamomile ($n=10$ in the survey), valerian and kava [30, 31]. Third, herbal supplements may interact with OTC NSAIDs. Some examples include an increase in bleeding risk with aspirin/NSAIDs with garlic, ginkgo biloba, turmeric, ginseng, feverfew and those containing coumarin (chamomile, horse chestnut) [31]. Several examples of such concomitant use were reported in this study, highlighting the importance of asking about them during a rheumatology consultation. Fourth, the prevalent use of vitamin and mineral supplements appears to contribute to an increase in population prevalence of intake above the upper tolerable level in high-income countries. This is a particular safety concern for fat-insoluble vitamins (A, D, K, E), especially when taken with a multivitamin [32]. In our study, multivitamins and vitamin B supplements were some of the most commonly reported supplements, with 19 (4.9%)

patients taking both. Large doses of vitamin B3 have been associated with hepatotoxicity, while a recent study involving >4300 participants with stable cardiac disease suggested that too much niacin (a type of B vitamin) may increase cardiovascular disease risk by provoking blood vessel inflammation [33]. This may be particularly important in rheumatology patients, who are known to already have a higher baseline cardiovascular risk compared with the general population. Healthcare professionals, where possible, should make themselves aware of reliable resources to direct patients to a variety of reliable self-management support resources [34, 35]. These include evidence-based online platforms, reputable patient advocacy groups and educational materials vetted by trusted health organizations.

In this study, patients with FM and axSpA were more likely to take sleep supplements compared with those without this diagnosis. Sleep disturbances associated with FM are well documented and thought to play a critical role in exacerbating pain symptoms [36]. A recent cross-sectional survey reported a high prevalence (46.6%) of sleep disturbance in patients with axSpA that may be associated with a significant reduction in quality of life [37]. The types of sleep supplements varied substantially (Fig. 3), with a considerable proportion of 45 (47%) patients opting for OTC and non-prescription options.

Pain relief was taken by the majority of patients in this study (82%), of which 51% were on some form of NSAID and 20% were on opioids. The most commonly administered opioids were co-codamol, codeine and tramadol, reflecting current prescribing practices in the UK [38]. Interestingly, however, 32% of patients used NSAIDs and 2.3% used opioids through non-prescription routes, i.e. bought on the internet or borrowed from a family member, suggesting it is especially important to ask about these sources in consultations from a drug safety perspective.

The strengths of the survey include that it was co-designed with patients and clinicians and the survey was anonymous, enabling more honest responses regarding more sensitive questions such as medications bought over the internet. We also sampled a relatively large proportion of rheumatology patients across a wide time frame during different times of the year. The results of the survey need to be considered in the context of its limitations. As this was an electronic survey, there may be issues regarding digital literacy, with some patients being unable to use smartphones or computers. The absence of a sampling strategy, such as random sampling, is a consideration in interpreting and reporting this study's findings. However, the demographics of rheumatology patients in this study in terms of age and gender were similar to our previous study in the same centre in which unselected rheumatology outpatient letters were used to develop a text-mining algorithm to automate national COVID-19 shielding criteria [39]. Additionally, the higher proportion of more deprived patients is in line with the demographics of Salford, and thus it is reassuring that the representativeness is not significantly skewed towards the less deprived. Given that the rheumatology department is a tertiary centre for specific conditions with a more deprived population, it is possible that the case mix is more complex, thus leading to more prevalent use of supplements. While minimal information is known about OTC supplement use in Europe, the pattern of supplement use may be different depending on whether these products/medicines are available via pharmacies or by prescription from their primary care provider. Finally, future work should focus on

comparing OTC supplement use with that of a healthy control group to assess how the use of these supplements/medicines differs from that of an RMD cohort. Despite the limitations, the findings provide valuable insights into the prevalence of OTC supplement use for sleep issues and pain management among rheumatology patients. This was a large survey across a tertiary rheumatology department with an intake of general and complex rheumatology patients.

Conclusions

In summary, there is a high prevalence of OTC supplement and non-prescription analgesic use in patients with RMDs. To our knowledge, there have been no recent estimates focusing on the use, types, costs and individual factors associated with each of these drugs across Europe. As patients rely increasingly on such self-management strategies and access health information from a variety of sources online, it is especially important, from a drug safety perspective, for healthcare professionals to proactively ask about such strategies in their consultations. This is especially true as there are concerns about their interactions with other conventional medicines and other OTC supplements, their quality in an unregulated market and their lack of standardized dosages. Healthcare professionals also need to be well equipped to provide reliable advice to patients on the scientific evidence regarding such medicines to help manage symptoms of pain, sleep and fatigue that can greatly impact quality of life.

Supplementary material

Supplementary material is available at *Rheumatology Advances in Practice* online.

Data availability

The data used for the survey are not publicly available without the completion of specific training requirements and information governance checks mandated by the data owners.

Authors' contributions

M.J. and W.G.D. conceived the study and design. M.J., W.G.D., S.L. designed the first draft of the survey and helped coordinate the data acquisition. S.L. led on obtaining feedback from the patient-advisory group and multidisciplinary team. R.B. was responsible for data management. M.S. performed the data preparation and analysis. M.S. and M.J. wrote the first draft of the manuscript. W.G.D., M.J., J.M. and M.L. contributed to funding acquisition. All authors edited and reviewed the final version.

Funding

Assembling the Data Jigsaw has been funded by the Nuffield Foundation's Oliver Bird Fund and Versus Arthritis, but the views expressed are those of the authors and not necessarily the funders. Visit <https://www.nuffieldfoundation.org> and <https://www.versusarthritis.org>. M.J. is funded by a National Institute for Health and Care Research (NIHR) Advanced Fellowship (NIHR301413). The views expressed in this publication are those of the authors and not necessarily those of

the NIHR, National Health Service or the UK Department of Health and Social Care.

Disclosure statement: The authors have declared no conflicts of interest.

Acknowledgements

We would like to thank all the survey participants for their contributions and the wider study team including Louise Cook and Ginny Mitchell for programme support.

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