Association between pain and mental health among undocumented immigrants in France

Sohela Moussaoui (✉ sohela.moussaoui@sorbonne-universite.fr)
Bordeaux University

Nicolas Vignier
Hôpitaux universitaires Paris Seine-Saint-Denis, Avicenne Hospital, AP-HP

Stéphanie Guillaume
Institut de Recherche et de Documentation en Économie de la Santé

Florence Jusot
Paris Dauphine University

Antoine Marsaudon
Institut de Recherche et de Documentation en Économie de la Santé

Jérôme Wittwer
Bordeaux University

Paul Dourgnon
Institut de Recherche et de Documentation en Économie de la Santé

Abstract

Purpose. Undocumented immigrants often face mental health issues and multisite pain. Links between pain and mental health have been described however not among undocumented immigrants in France. Describing these associations supports further research on the mental health of this population, especially when no cause can explain the pain. The main objective of this study was to analyze associations between pain and mental health among undocumented immigrants in France.

Methods. We drew from the data collected in the multicentric cross-sectional "Premier Pas" study carried out in the Parisian and Bordeaux region between February and April 2019. Undocumented immigrants over the age of 18 were included from sixty-three sites. Participants were asked about their mental health and whether they were experiencing pain. Associations were explored using univariate and multivariate analysis with logistic regression models.

Results. Among 1188 research participants, our results showed associations between pain and mental health: musculoskeletal pain with sleep disorder and abdominal pain with anxiety and sleep disorder. Also, social determinants of health such as the duration of residence in France, housing conditions or food insecurity were associated with different types of pain.

Conclusion. This study is the first to document the existence of associations between pain experienced by undocumented immigrants in France and their mental health. It provides a new contribution to the French literature and evidence for clinicians to investigate the mental health ofundocumented immigrants experiencing pain.

Introduction

In 2021, immigrants accounted for 10.3% of the total French population [1]. The immigrant population can be differentiated by their undocumented or documented status. There are a variety of situations where a person may be undocumented. It can be due to their entry into France without a residence permit, due to the expiration of a residence permit that is no longer valid or for asylum seekers, when the application has been refused.

In France and in Europe health disparities exist between the host population and immigrants tied to socio-economic factors and working conditions [2, 3]. Migration-related stressors such as physical and verbal violence, discrimination, limited material and social conditions and constant fear of deportation affect both somatic and mental health [4, 5].

High rates of mental conditions have been found among undocumented immigrants when compared to the host population [6, 7]. Post-traumatic stress disorder (PTSD) is the most commonly found, but depression, anxiety, stress or sleep disorder appear to be highly prevalent during and after the migration journey [6, 8]. In Sweden, it seems that PTSD is more prevalent among undocumented immigrants than in the general population [9]. In Europe, depression seems more prevalent among immigrants than the host population and is influenced by low socio-economic status and integration policies [10].

In the general population, pain is a frequent reason for consultation [11]. Evidence from different countries have found that the prevalence of pain, particularly musculoskeletal pain, is high among immigrants [5, 12]. In France, annual reports by international NGO (Non-Governmental Organization) such as Doctors of the World provide data on immigrant's health and give an insight into the importance of the different types of pain reported by this population [13].

Pain doesn't only affect quality of life, it also has a negative impact on self-rated health and mental health [14, 15]. Social support and, more broadly, social capital are important factors which help to explain disparities in self-rated health between the French population and the immigrant population [3].

Some theories offer to explain how pain and mental health may be connected. Developed by Sharp, the "mutual maintenance theory suggests that chronic pain may exacerbate and maintain PTSD while PTSD may exacerbate and maintain chronic pain [16]. According to this theory, mutual maintenance occurs through specific mechanisms such as reminders of the trauma, depression and reduced activity levels. Even if some European studies have described the existence of an association between pain and mental health among immigrant populations, it is not possible to identify a causal pathway because these are exclusively observational studies [7, 17, 18].

The prevalence of reported pain as well as the relationship between reported pain and mental health remains under-studied among undocumented immigrants in France. Thus, the main objective of this study was to analyze the association between mental health and reported pain among this population, in order to develop literature on these issues. The secondary objective was to study the influence of social determinants of health in the different types of pain experienced by undocumented immigrants in France.

Methods

Study design. Premier Pas was a multicentric cross-sectional study carried out in the Parisian and Bordeaux region between February and April 2019. This study, based on multidisciplinary approaches, sought to better understand the experience of undocumented immigrants living in France with regard to their health status, access to rights and healthcare. Inclusion criteria consisted of being undocumented and over 18 years old. Fourteen different languages were used to translate the questionnaire and interact with participants. Details of the methodology can be found in already published articles [19–21]. Individuals were recruited from 63 places and structures that provide support or assistance for the socially deprived and immigrants [19]. The structures included "Espace Solidarité Insertion" (which offer daytime shelter, social and health services for homeless people), NGOs, Hospital Health Access Sites ("Permanence d'Accès aux Soins de Santé"). The latter provide social assistance and healthcare to vulnerable populations, but their geographic scope is limited to certain cities. Additionally, another structure included local health insurance centers ("Caisses Primaires d'Assurance Maladie") which operate at a departmental level and deliver various social subsidies and indemnities for registered members, for claims ranging from sickness, pregnancy, disability or death. Point of Access to Rights ("Point d'accès aux droits") which are free and permanent reception sites that provide information and resources, for legal or administrative problems

were also structures where participants were recruited. Additionally, three more structures included the shower baths, the free health centers of Doctors of the Word ("CASO") as well as the maternal and child protection centers ("Protection Maternelle et Infantile") which is a departmental service responsible for ensuring the health protection of mothers and children.

Data collection. Socioeconomic variables were collected and categorized into coherent groups: demographic characteristics (age and gender), social characteristics (current job, job in the country of origin, fluency in French), family environment (isolation), material living conditions (housing type, food insecurity) and access to care ("Aide Médicale de l'Etat", AME). The AME or State's Medical Assistance is a specific means-tested health insurance program that enables access to healthcare free of charge for undocumented immigrants in France with some restrictions. (Legal and Administrative Information Directorate (Prime Minister), 2023.) Conditions for access to the AME include being undocumented, residence in France for more than three months, and financial resources below a determined threshold. It should be noted that the conditions of AME's eligibility and access have recently been modified, but this study was conducted before these changes that added the obligation to submit the file in-person and a compulsory waiting period for certain "non-urgent" care.

Mental health was assessed through several questions. Participants were asked if they were currently experiencing a list of conditions including mental health conditions. If the participant answered "yes" to mental health then follow-up questions were asked in order to specify if it was depression, sleep disorder, or anxiety. For depression, we used the PHQ-9 questionnaire and a cut-off score of 10 or more to estimate moderate to severe depression [23]. The PHQ-9 questionnaire is composed of nine items and for each question the participant was asked how often he/she has been bothered by the problems mentioned in the items (little interest or pleasure in doing things, feeling sad, depressed or hopeless, etc.). PTSD was assessed with the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) [24]. A score of three or above was used as a threshold for PTSD.

Several types of pain were expressed by the participants: abdominal pain, headache/migraine, joint pain, muscle pain, chest pain or pelvic pain. We created a "musculoskeletal pain" category by grouping together muscle and joint pain. The "abdominal pain" did not include pelvic pain expressed exclusively by women.

Data analysis. First, we described the prevalence of different types of pain using percentages and compared each type of pain according to the different mental health conditions and socioeconomic indicators using a chi-square test. Data was weighted based on the probability of inclusion. We then performed univariate and multivariate analyses using logistic regression for each type of pain. In the final multivariate models, we included only the mental health-related variables with a crude OR's (odds-ratio) p-value <0.200 in the univariate analyses. We adjusted the models with socioeconomic variables by adding to the final model variables with a crude OR's p-value inferior to 0.200 or, within a group of variables, the variable with the smallest p-value if all the variables had a p-value superior or equal to 0.200.

In a second step, all the models were stratified by gender, as the literature has shown that associations between pain and mental health are influenced by gender [25, 26].

In multivariate analyses, due to small numbers, some age categories we grouped together. For "abdominal pain" and "headache" in the male model, the categories "40-59" and "60 and more" were grouped into "40 and more". For abdominal pain, the categories "18-29" and "30-39" were grouped together into "18-39".

All analyses have been performed with Stata© 15.1 software.

Results

A total of 1,223 participants were included in the Premier Pas survey and 1,188 answered the questions related to current health conditions. Out of the 1223 participants included in the study, 28.8% were female, 36.2% were aged 18-29 and 33.9% aged 30-39. In terms of geographic origins, 62.5% of participants were from sub-Saharan Africa and 23.7% were from North-Africa. Roughly half of the individuals in the sample were covered by the AME [20].

Among the 1,188 who answered to the health-related questions, 14.3% reported a pain (n=176) regardless of the type, 8.3% (n= 103) reported musculoskeletal pain, 3.5% (n=48) reported abdominal pain, 2.7% (n=37) reported a headache, 1.2% reported pelvic pain (n=25) and 1.8% reported chest pain (n=12). (Table 1)

Pain and mental health. For each type of pain, table 2 represents comparisons with mental health-related variables. Except for pelvic pain, individuals declaring any type of pain had higher rate of sleep disorder. Participants with abdominal pain had a higher rate of anxiety and depression. Participants with pelvic pain had a higher rate of anxiety and depression and finally, participants with chest pain had a higher rate of depression.

The multivariate analyses adjusted for socioeconomic indicators (see table 3) showed that musculoskeletal pain was associated with higher risk of sleep disorder (adjusted odds-ratio, aOR= 2.53, 95%CI [1.20 - 5.33], p= 0.014), abdominal pain with higher risk of anxiety (aOR= 2,38, 95%CI [1.03 − 5.51], p= 0.043) and sleep disorder (aOR= 2.71, 95%CI [1.07 − 6.83], p= 0.035). No significant association was found between having a headache and a mental health condition.

The multivariate analyses adjusted for socioeconomic indicators and stratified by gender showed that abdominal pain was associated with a higher risk of sleep disorder (aOR=7.08 95%CI [1.47 - 34.17], p=0.015) and anxiety (aOR=3.96 95%CI[1.17 - 13.42] p=0.027). Headache was associated with a higher risk of sleep disorder (aOR=66.18 95%CI [13.76 - 318.33] p<0.001) among women. Table 4

Among male participants, musculoskeletal pain was associated with a higher risk of sleep disorder (aOR=7.14 95%CI[1.60 - 31.87], p= 0.010) and anxiety (aOR=0.12 95%CI[0.02 - 0.82], p=0.031) whereas abdominal pain was associated with a higher risk of depression (aOR=7.72 95%CI[2.10 - 28.28] p=0.002).

Social determinants of health. Abdominal and chest pains were more prevalent among those who often experienced food insecurity and chest pain was more prevalent among those who were not covered with the AME. Table 1

Multivariate analyses showed several associations between different types of pain and social determinants of health (See supplementary files: table S1). Fluency in French assessed as "Not very well/poor or very bad" was associated with higher abdominal pain when compared to the group with better fluency. Living alone (single and without children) and living in collective housing was associated with a higher risk of having headaches.

The gender-stratified analyses also showed associations with several social determinants of health (See supplementary files table S2 and S3). Older age was associated with a higher risk of musculoskeletal pain and headaches among women. Women originating from North-Africa had a higher risk of musculoskeletal pain and abdominal pain when compared to those originating from sub-Saharan Africa. For women, a shorter period of residence in France was associated with a higher risk of musculoskeletal pain and headaches and with a lower risk of abdominal pain, and for men this variable was associated with a higher risk of abdominal pain and a lower risk of headaches. Women who often experience food insecurity were at higher risk of abdominal pain.

Men living in collective housing were at higher risk of headaches when compared to those living in ordinary types of housing. For men, having a job was associated with a lower risk of headaches.

Discussion

Pain and mental health

Comparison with other studies. Overall, our results revealed clear associations between several types of pain and several mental health conditions and are consistent with international literature. A recent study in Sweden found a higher risk of chronic and severe pain among immigrants with an important role played by financial hardship, depression, and anxiety [18]. A cohort surveying Syrian refugees in Norway followed up 12 months after their arrival in Northern Europe, found that poor mental health was a predictor of chronic pain at follow-up [17]. In this study, chronic pain was also associated with migration-related stressors such as poor safety, poor physical environment or poor access to health care. Other studies also suggest that migration experiences in the post-migration phase are of greater importance when evaluating pain and mental health disorders among refugees [27, 28]. Other studies also support that trauma and pain are connected especially for headaches and joint pain [29].

When it comes to the relationship between PTSD and pain, it appears that depression can maintain both the condition and can play the role of a proxy risk factor for the association between pain and PTSD [29, 30]. Our study did not find similar results, probably because these studies were conducted among older individuals (veterans' population mostly) who had higher prevalence of PTSD and no history of migration.

Gender-based differences. Overall, except for musculoskeletal pain and headaches, men had lower rates of reported pain than women. One reason that could explain this result is that pain verbalization can be influenced by gender and is less easily expressed by men not because of biological differences but because of gender performativity [31]. At the same time, the verbalization of anxiety also appears to be gender biased. Male participants appear to be less inclined to express their anxiety easily but would do so more easily in certain contexts such as in online forums or to women in their close circle (wife, mother). [32].

Our study highlighted associations between self-reported pain and mental health, in particular sleep disorder and anxiety, both for women and men. A study conducted among young adults in The Netherlands found that gender affected the association between sleep disorders and musculoskeletal pain and abdominal pain (but not on headaches as opposed to our study), with stronger symptoms among women [26]. In our study, musculoskeletal pain was associated with higher sleep disorder among men, but not among women where no association was found. This association between musculoskeletal pain and sleep disorders among women is however described in the literature, which may suggest that our study lacked power to highlight this association [26, 33]. It should be noted that another recent study conducted among minors found similar results to our study: boys with sleep problems were at greater risk of musculoskeletal pain and this risk also did not appear among girls [34].

Surprisingly, musculoskeletal pain was associated with lower anxiety among men, but no association was found among women. The association usually found in the literature describes how anxiety is a risk factor for musculoskeletal pain [35]. Nevertheless, one study conducted among veterans found that when anxiety is associated with PTSD it may reduce pain perceptions [29]. We did not find this association between anxiety and PTSD in our study, again possibly due to the lack of power.

Abdominal pain was associated with a higher risk of sleep disorder and anxiety among women and higher risk of depression among men. Similar to our results, a Dutch study found that sleep disorder increased abdominal pain severity but only among women [26].

Association of abdominal pain with anxiety and depression is also described in the literature, both for men and women [25, 36]. Socioeconomic status appears to mediate the association of gastrointestinal disorders (associate with abdominal pain), with depression and anxiety [37].

Headaches were associated with higher risk of sleep disorders among women. Sleep disorders (lack of sleep, non-restorative sleep, snoring) is well documented in the literature as a risk factor for headaches, especially among women [38].

Pain and the social determinants of health

Our results showed a relatively high prevalence of pain, especially for musculoskeletal pain. Overall, higher risk of pain was associated with the most deprived situations. Evidence from different countries have also found that pain prevalence was high among different groups of immigrants, in particular musculoskeletal pain [5, 12, 39, 40].

Depending on the site, musculoskeletal pain prevalence varies up to one third in the general population and increases with age [41]. The rates we found in our participant pool were two-to-five times lower than in the French general population and we also found that the prevalence increased with age even if higher musculoskeletal pain was associated with higher age only among women. In the same cohort that was representative of the general population in France, participants without a job had higher prevalence of pain regardless of the site and at the same time the prevalence were higher among female and male manual workers [41]. In our study, no differences were found between those with and those without job. As for abdominal pain, the last study representative of the general population in France showed that seventy percent of subjects had digestive complaints which is higher than the prevalence we found among our population of undocumented immigrants [42]. Among women only, higher abdominal pain was associated with food insecurity.   Authors have also described a graded association between food insecurity status and site-specific pain and in particular abdominal pain [43].

As for headaches, in the general population in France, nearly one person out of two declares being subject to headaches which is way above our findings among undocumented individuals, with higher prevalence among women and younger age groups which is also comparable to our findings [44].

Hypotheses to explain the associations. Overall, few hypotheses are developed in the literature to explain the link between sleep disorders and a higher risk of pain: lower levels of physical activity and fatigue both have been found to be associated with higher risk of pain [45, 46]. To try to explain some of these associations between pain and mental health, Sharp developed the "mutual maintenance theory" in which anxiety sensitivity (AS) is defined as a "measure of the tendency toward misinterpreting anxiety symptoms as indicative of harm". With this theory, Sharp explained how anxiety sensitivity plays a role in maintaining co-morbid chronic pain and PTSD symptoms and could be a risk factor in the association between PTSD symptoms and somatic complaints [16, 29]. Our study did not include a measure of sensitive anxiety, in particular because its measurement is delicate. However, this may be relevant for future studies.

Perspectives and treatments. Few studies evaluate the impact of pain treatment on reported pain and mental health. However, it seems that physical pain may interfere with a patient's ability to respond to PTSD treatment and that the presence of a mental health condition could also interfere with effective pain management [29]. The influence of cognitive-behavioral treatment for PTSD on comorbid patient seems effective both on PTSD symptoms and pain [30]. Some ongoing studies are evaluating the effects of expressive writing or hypnosis, especially when pain and PTSD are associated with anxiety [29]. Another ongoing study aims to assess two different interventions to reduce pain and post-traumatic symptoms among refugees from Syria living in Norway: the "Physiotherapy Activity and Awareness Intervention" that consists of combination of psychomotor and general physiotherapy, as well as the "Teaching Recovery Technique" which refers to cognitive behavioral therapy [47].

In conclusion, our study highlights the importance of identifying the pain experienced among undocumented immigrants because of its prevalence but also because it can be associated with mental health conditions and vice versa. We are of the understanding that this study is the first to document the prevalence of pain and its association with mental health among undocumented immigrants in France. Musculoskeletal, abdominal pain and headaches are among the most common conditions in primary care and this study shows that it is also prevalent among immigrants [11].   The study also provides practitioners arguments to ask more systematically questions pertaining to mental health and to help implement targeted interventions in particular when these pains remain medically unexplained. We can regret the lack of power that did not allow us to further explore the implication of PTSD and depression in the different reported pains that would have allowed us to further study the influence of the AME. Furthermore, our study includes selection biases mainly because the recruitment took place in two large cities and may not reflect all of undocumented immigrants in the rest of France. Future research with larger samples should thoroughly investigate immigration-related factors including a wide-range of sociodemographic and health-related factors that may contribute to the health status among immigrants. These studies should also include factors that were found to influence mental health such as reduced physical activity levels or AS.

Declarations

Statements and Declarations

Competing Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors declare they have no financial interests.

Conflict of interest

The authors declare that they have no conflict of interest.

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Ethical approval and consent

This study involving human participants was reviewed and approved by Institute for Research and Documentation in Health Economics.   Informed consent for participation was obtained for each participant of the study in accordance with the national legislation and the institutional requirements.

The study was conducted under the control of the CNIL (Commission nationale de l'informatique et des libertés, registration number:2203002 v 0)

Consent to participate

Informed consent was obtained from all individual participants included in the study. Verbal informed consent was obtained prior to the interview.

Material

The raw data supporting the conclusions of this article will be made available by the authors upon request.

Authors' contribution statements

All authors whose names appear on the submission:

1) made substantial contributions to the conception or design of the work, analysis and interpretation of data; or the creation of new software used in the work

2) drafted the work or revised it critically for important intellectual content

3) approved the version to be published

4) agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Tables

Table 1: Prevalence of the different types of pain, Premiers Pas 2010

		Musculoskeletal pain			Abdominal pain			Headache			Pelvic pain		
	N	n	weighted percentage	p-value	n	weighted percentage	p-value	n	weighted percentage	p-value	n	weighted percentage	p-value
All	1188	103	8.3%		48	3.5%		37	2.7%		25	1.2%	
Demographic characteristics													
Gender	1185	1185		0.660	1185		0.586	1185		0.364	1185		<0.001
Woman	418	44	7.5%		17	4.2%		21	3.8%		22	3.8%	
Man	767	59	8.6%		31	3.3%		16	2.2%		3	0.2%	
Age class	1181	1181		0.486	1181		0.061	1181			1181		0.032
18-29	319	22	9.1%		8	1.6%		7	3.8%	0.389	7	0.7%	
30-39	432	30	6.8%		19	5.6%		18	2.8%		6	0.7%	
40-59	374	41	8.1%		19	3.8%		10	1.3%		12	2.8%	
60 and more	56	9	19.6%		2	1.8%		2	1.7%		0	0.0%	
Social characteristics													
Current job	1178	1178		0.488	1178		0.517	1178		0.156	1178		0.312
Yes	278	18	6.4%		10	2.8%		6	1.3%		2	0.6%	
No	900	84	8.8%		38	3.8%		31	3.1%		23	1.4%	
Job in the country of origin	1179	1179		0.198	1179		0.620	1179		0.574	1179		0.061
Employee and self-employed	526	53	10.9%		20	3.8%		21	2.2%		15	2.0%	
Manual worker	352	22	6.9%		21	4.1%		7	3.9%		3	0.5%	
Students and other	100	12	5.0%		0	0.0%		3	1.3%		2	1.0%	
does not work/has never worked	201	15	5.0%		7	3.7%		6	2.3%		4	0.5%	
Fluency in the French	1187	1187		0.102	1187		0.080	1187		0.144	1187		0.062
Very good/somewhat good	637	60	10.6%		21	2.1%		20	1.9%		16	1.6%	
Not very well/poorly or very badly	269	23	5.0%		15	5.8%		11	5.5%		7	1.5%	
non-French speaking	281	20	5.0%		12	5.3%		6	1.8%		2	0.1%	
Migration characteristics													
Region of origin	1175	1175		0.381	1175		0.503	1175		0.169	1175		<0.001
North-Africa	356	30	10.7%		13	4.4%		8	1.4%		4	0.4%	
Sub-Saharian Africa	615	56	8.1%		26	2.8%		26	3.3%		20	1.8%	
Other	204	16	4.8%		8	5.1%		2	1.1%		1	0.1%	
Arrival in France	1182	1182		0.836	1182		0.853	1182		0.359	1182		0.461
Less than 3 months	128	11	5.9%		5	2.1%		6	0.9%		4	2.3%	
[3 months -1 year[	318	28	8.2%		10	3.3%		8	3.3%		11	1.7%	
[1 year -3 years]	307	30	9.2%		18	4.8%		10	3.4%		8	1.2%	

	N		%	p		%	p		%	p		%	p
[3 years -5 years[	144	9	11.9%		3	3.3%		5	4.8%		1	0.5%	
More than 5 years	285	24	6.8%		12	3.5%		7	0.7%		1	0.5%	
Motive for migration	**1016**	**1016**		0.941	**1016**		0.433			0.603	**1016**		0.814
Health	120	14	9.2%		6	5.0%		5	1.4%		2	1.0%	
Not health	896	74	8.9%		31	3.1%		24	2.1%		18	1.2%	
Family environment													
Isolation	**1159**	**1159**		0.331	**1159**		0.139	**1159**		0.118	**1159**		0.517
Alone	458	32	9.7%		12	1.9%		11	3.8%		9	1.1%	
Alone with child	221	29	8.7%		13	5.5%		11	4.3%		8	2.0%	
In a couple without children	129	10	12.4%		4	2.3%		4	1.4%		2	0.5%	
In a couple with child(ren)	351	27	4.6%		18	5.3%		10	0.7%		6	1.3%	
Material living conditions													
Housing type	**1181**	**1181**		0.098	**1181**		0.428	**1181**		<0.001	**1181**		0.286
Ordinary	522	43	9.1%		17	3.2%		**14**	**0.9%**		14	1.3%	
Collective	215	28	13.4%		14	5.6%		**13**	**9.8%**		6	2.3%	
Precarious	444	32	5.1%		17	2.9%		**10**	**1.0%**		5	0.7%	
Food insecurity	**1181**	**1181**		0.655	**1181**		0.049	**1181**		0.245	**1181**		0.332
Often	312	26	6.7%		**26**	**6.3%**		14	4.3%		8	0.9%	
Sometimes	431	40	9.9%		**11**	**2.6%**		8	1.2%		10	1.9%	
Never	438	35	7.7%		**10**	**2.1%**		14	2.8%		7	0.9%	
Access to care													
Aide Médicale d'Etat	**1184**	**1184**		0.404	**1184**		0.865	**1184**		0.503	**1184**		0.286
Yes	514	47	9.7%		17	3.3%		15	3.3%		8	0.9%	
No	670	55	7.2%		30	3.6%		22	2.2%		17	1.6%	

p-value: p-value using chi-square test

Table 2: Prevalence of the different types of pain and comparison with mental health-related variables. Premiers Pas 2010

	N	weighted percentage	n	weighted percentage	p-value	n	weighted percentage	p-value	n	weighted percentage	p-value	n
			Musculoskeletal pain			**Abdominal pain**			**Headache**			**Pelvic pai**
Anxiety	**1188**		1188		0.914	**1188**		**<0.001**	1188		0.105	**1188**
Yes	131	11.5	15/131	8.6%		**12/131**	**12.9%**		10/131	6.3%		**6/131**
No	1057	88.5	88/1057	8.2%		**36/1057**	**2.3%**		27/1057	2.2%		**19/1057**
Sleep disorder	**1188**		**1188**		0.019	1188		**<0.001**	1188		**<0.001**	1188
Yes	176	15.0	**26/176**	**16.3%**		15/176	11.50%		**19/176**	**10.5%**		5/176
No	1012	95.0	**77/1012**	**6.8%**		33/1012	2.10%		**18/1012**	**1.3%**		20/1012
Depression	**1031**		**1011**		0.814	**1011**		0.019	1011		0.651	**1011**
Yes	384	29.5	45/379	8.5%		**20/379**	**6.2%**		18/379	2.3%		**13/379**
No	647	70.5	47/632	9.1%		**15/632**	**2.0%**		14/632	3.0%		**8/632**
PTSD	**1176**		**1150**		0.169	**1150**		0.183	**1150**		0.332	1150
Yes	210	16.2	29/208	12.7%		14/208	5.7%		8/208	4.8%		5/208
No	966	83.8	71/942	7.6%		33/942	3.2%		29/942	2.4%		19/942

p-value: p-value using chi-square test

PTSD: Post-traumatic Stress disorder

Table 3: Mental health variables associated with the 3 different types of pains in multivariate logistic analysis, adding variables by block

	Musculoskeletal pain				Abdominal pain				Headache			
	Univariate analysis	Final model M1 n= 1088			Univariate analysis	Final model M2 n= 953			Univariate analysis	Final model M3 n= 1117		
	OR	aOR	95%CI	p-value	OR	aOR	95%CI	p-value	OR	aOR	95%CI	p-value
Depression												
Yes	0.92	/	/	/	3.31*	2.83°	[0.89 - 9.04]	0.079	0.77	/	/	/
No	ref	/	/	/	ref	ref	ref	ref	ref	/	/	/
Sleep disorder												
Yes	2.67*	2.53*	[1.20 - 5.33]	0.014	5.94***	2.71*	[1.07 - 6.83]	0.035	8.98**	6.14°	[0.72 - 52.64]	0.098
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Anxiety												
Yes	1.05	/	/	/	6.27***	2.38*	[1.03 - 5.51]	0.043	2.98°	1.07	[0.22 - 5.34]	0.933
No	ref	/	/	/	ref	ref	ref	ref	ref	ref	ref	ref
PTSD												
Yes	1.76°	1.31	[0.61 - 2.79]	0.489	1.81°	1.29	[0.45- 3.66]	0.633	2.09	/	/	/
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	/	/	/

OR : crude odds-ratio. aOR : adjusted odds-ratio ; p-value : °p < 0.20 ; *p < 0.05 ; **p < 0.01 ; ***p < 0.001

95%CI: 95% Confidence interv /: variable not included in the final model

ref: reference category

M1, M2 and M3: Models after adjusting for mental health related variables

PTSD: Post-traumatic stress disorder

Table 4: Mental health variables associated with the 3 different types of pains in multivariate logistic analysis. stratified by gender

WOMEN

	Musculoskeletal pain				Abdominal pain				Headache			
	Univariate analysis	Final model M1' n= 256			Univariate analysis	Final model M2' n= 306			Univariate analysis	Final model M3' n= 401		
	OR	aOR	95%CI	p-value	OR	aOR	95%CI	p-value	OR	aOR	95%CI	p-value
Depression												
Yes	**4.90****	3.59°	[0.93 13.82]	0.063	2.11	/	/	/	1.62	/	/	/
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Sleep disorder												
Yes	**3.16***	1.70	[0.35 - 8.31]	0.509	**10.03****	**7.08***	**[1.47 - 34.17]**	**0.015**	32.43***	66.18***	[13.76 - 318.33]	<0.001
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Anxiety												
Yes	**5.10****	2.94°	[0.87 - 9.92]	0.083	**11.76****	**3.96***	**[1.17 - 13.42]**	**0.027**	11.19**	1.23	[0.33 - 4.59]	0.756
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
PTSD												
Yes	2.42°	1.52	[0.46 - 5.05]	0.496	2.87°	2.07	[0.66- 6.45]	0.212	0.650	/	/	/
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref

MEN

	Musculoskeletal pain				Abdominal pain				Headache			
	Univariate analysis	Final model M1″ n= 548			Univariate analysis	Final model M2″ n= 628			Univariate analysis	Final model M3″ n= 560		
	OR	aOR	95%CI	p-value	OR	aOR	95%CI	p-value	OR	aOR	95%CI	p-value
Depression												
Yes	0.42°	0.28°	[0.05 - 1.47]	0.131	**4.45***	**7.72****	**[2.10 - 28.28]**	**0.002**	0.30°	0.12°	[0.01 - 1.40]	0.091
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Sleep disorder												
Yes	2.57°	**7.14***	**[1.60 - 31.87]**	**0.010**	**4.72****	1.38	[0.29 - 6.50]	0.686	4.62°	0.69	[0.10 - 4.66]	0.706
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Anxiety												
Yes	0.35°	**0.12***	**[0.02 - 0.82]**	**0.031**	**4.86***	4.47°	[0.91 - 21.83]	0.064	0.81	/	/	/
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
PTSD												
Yes	1.57	/	/	/	1.32	/	/	/	3.74°	3.43°	[0.91 - 12.94]	0690
No	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref	ref

OR : crude odds-ratio. aOR : adjusted odds-ratio ; p-value : °p < 0.20 ; *p < 0.05 ; **p < 0.01 ; ***p < 0.001

95%CI: 95% Confidence interval.

/: variable not included in the final model

ref: reference category

M1', M2',M3', M1″, M2″ and M3″: Models after adjusting for mental health related variables

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTablesS1S2andS3.pdf