Adolescents' health and its relation with negative psychosocial factors in a sample of Moroccan high school students

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Tétouan 2019

Cover page: World Heritage: Medina of Tétouan. Photo by Btissame Zouini

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ISBN 978-9920-38-138-3 (PRINT)

ISBN 978-9920-38-138-3 (PDF)

Printed in BrandFactory AB

Abstract

Background: Adolescence is the transitional period between childhood and adult life, accompanied by numerous neurobiological, physical and psychological changes. During this developmental period, the environment greatly influences the adolescent's educational attainments, potential to live a fulfilling and productive life, behaviors, and somatic and mental health.

Aims: The aims of this thesis were to explore the prevalence of defined somatic symptoms/disorders, the levels of psychological distress and the frequency of aggressive and antisocial behaviors in a sample of Moroccan high school students. The explorative analyses were gender sensitive. Furthermore, the thesis aimed to investigate the relation between negative psychosocial factors (parental alcohol use problems and the experience of physical and/or psychological abuse) and the somatic and mental health and destructive behaviors of high school students.

Subjects and methods: The data collection was carried out within the framework of the "Mental and Somatic Health without borders" (MeSHe) project (www.meshe.se). Self-reported data from Moroccan high school students were used to analyze somatic health issues (655 students), psychological distress levels and the frequency of aggressive and antisocial behaviors (375 students). The evaluation was based on a set of questionnaires including sociodemographic data, self-reported medical history and the validated instruments: the Brief Symptom Inventory and the Life History of Aggression.

Results: A majority of the sample of Moroccan high school students reported some kind of somatic complaint and a substantial level of psychological distress. Female students indicated significantly more somatic and mental health complaints than did their male classmates, while male students reported higher frequencies of aggressive and antisocial behaviors.

Negative psychosocial factors in the adolescent's life were associated with increased prevalence of several somatic complaints (epilepsy, migraine, headache, diarrhea/constipation, gluten intolerance and thyroid diseases), with significantly higher levels of psychological distress (especially somatization) and with significantly increased frequency of aggression, self-directed aggression and antisocial behaviors.

Conclusion: Moroccan female high school students report worse somatic and mental health conditions than do their male student colleagues. The previously shown gender-specific patterns in aggressive and antisocial behaviors, but not in self-harm behaviors, were confirmed in the Moroccan sample. Adolescents reporting negative psychosocial environmental factors in their life need synchronized support from social- and health care services.

Keywords: adolescents, gender, Morocco, somatic health, mental health, aggression, antisocial behaviors, negative psychosocial factors.

Résumé

Contexte : L'adolescence est la période de transition entre l'enfance et la vie adulte, accompagnée de nombreux changements neurobiologiques, physiques et psychologiques. Au cours de cette période de développement, les facteurs environnementaux ont un effet remarquable sur les résultats scolaires de l'adolescent, son potentiel à mener une vie épanouie et productive, ainsi que ses comportements, sa santé somatique et mentale.

Objectifs : Les objectifs de cette thèse étaient d'explorer la fréquence des symptômes/troubles somatiques définis, le niveau de détresse psychologique et les comportements agressifs et antisociaux chez un échantillon des lycéens marocains. Les analyses exploratoires étaient sensibles au genre. La thèse visait également à étudier la relation entre les facteurs psychosociaux négatifs (problèmes de consommation d'alcool chez les parents et l'expérience d'abus physique et/ou psychologique) et la santé somatique et mentale ainsi que les comportements agressifs et antisociaux chez les adolescents.

Sujets et méthodes : La collecte de données a été réalisée dans le cadre du projet "Santé mentale et somatique sans frontières (MeSHe)" (www.meshe.se). Les données auto-déclarées de lycéens marocains ont été utilisées pour analyser les problèmes de santé somatique (655 lycéens) ainsi que les comportements agressifs et antisociaux et le niveau de détresse psychologique (375 lycéens). L'évaluation s'est faite à l'aide d'un questionnaire composé d'une partie pour les données sociodémographiques et les antécédents médicaux auto-déclarés, le *Brief Symptom Inventory* (BSI) et le *Life History of Aggression* (LHA).

Résultats : La majorité de la population d'étude a signalé un type de problème somatique et un niveau élevé de détresse psychologique. Tant pour la santé somatique que mentale, les étudiantes ont déclaré significativement plus de problèmes que leurs camarades masculins. Cependant, ces derniers ont reporté une fréquence plus élevée en regard des comportements agressifs et antisociaux.

Des facteurs psychosociaux négatifs (problèmes de consommation d'alcool par les parents et/ou expérience d'abus physique et/ou psychologique) chez les adolescents sont associés à une prévalence accrue de nombreux problèmes somatiques (épilepsie, migraine, maux de tête, diarrhée/constipation, intolérance au gluten et maladies de la thyroïde), et un niveau de détresse psychologique significativement plus élevé (en particulier la somatisation), en addition à une fréquence nettement accrue d'agression, d'agression autodirigée et de comportements antisociaux en comparaison aux étudiants ne signalant pas ces facteurs psychosociaux négatifs.

Conclusion : Les adolescentes marocaines ont des profils de santé somatique et mentale plus dégradés que leurs camarades masculins. Les modèles antécédents expliquant les comportements agressifs et antisociaux différentiels selon le sexe ont été également confirmés chez cette population de lycéens marocains, contrairement à ceux en relation avec les comportements d'automutilation. Les adolescents signalant la présence des facteurs environnementaux psychosociaux négatifs dans leur vie ont besoin d'un soutien synchronisé de la part des services sociaux et des services de santé.

Mots-clés : Adolescents, sexe, Maroc, Santé somatique, Santé mentale, Agression, Comportements antisociaux, Expérience d'abus, Facteurs psychosociaux négatifs.

ملخص

تعتبر المراهقة الفترة الانتقالية الفاصلة بين مرحلتي الطفولة والرشد، والتي ترافق بالعديد من التغييرات الجسدية والنفسية. بالإضافة إلى التغيرات البيولوجية العصبية التي تحدث خلال هذه المرحلة، تعتبر العوامل والتغيرات النفسية والاجتماعية مؤثرة على التحصيل العلمي للمراهق، وقدرته على عيش حياة جيدة ومنتجة، وكذلك على سلوكه، وصحته الجسدية والعقلية.

أهداف هذه الأطروحة هي تحديد معدلات انتشار بعض الأعراض / الاضطرابات الجسدية المحددة، ومستوى السلوكات العدوانية والمعادية للمجتمع عند عينة من المتمدرسين المغاربة بالسلك الثانوي التأهيلي، بالإضافة الى كشف العلاقة بين العوامل النفسية والاجتماعية السلبية (مشاكل تعاطي الكحول عند الوالدين و / أو تجربة التعرض للإيذاء البدني و / أو النفسي) و الصحة الجسدية، العقلية السلوكات العدوانية و المعادية للمجتمع عند عينة من المتمدرسين المغاربة بالسلك الثانوي التأهيلي.

تم جمع البيانات في إطار مشروع "الصحة العقلية والجسدية بلا حدود (www.meshe.se) "(MeSHe). لتحديد مستوى السلوك العدواني والمعادي للمجتمع و الصحة النفسية تم تحليل 375 معطى في حين أنه لتحديد مستوى الصحة الجسدية تم تحليل 655 من البيانات المبلغ عنها ذاتيا من قبل المتمدرسين المغاربة بالسلك الثانوي التأهيلي. استند التقييم على مجموعة من الاستبيانات بما في ذلك البيانات الاجتماعية والديموغرافية، والتاريخ الطبي، جرد الأعراض المختصرة (BSI) ، والتاريخ العدواني المُعاش (LHA) .

بينت النتائج أن اغلبية المتمدرسين المغاربة بالسلك الثانوي التأهيلي للعينة المدروسة أبلغوا عن وجود مشاكل و اضطرابات على مستوى الصحة الجسدية ومستوى عالٍ من الضيق النفسي. بالنسبة لكل من الصحة الجسدية والعقلية، أبلغت التلميذات أيضًا عن مستوى عال من هذه المشاكل مقارنة بالتلاميذ الذكور، الذين أبلغوا في المقابل عن تردد عال للسلوكيات العدوانية والمعادية للمجتمع.

ان الابلاغ عن تواجد عوامل نفسية واجتماعية سلبية (مشاكل تعاطي الكحول عند الوالدين و / أو التعرض للإيذاء الجسدي و / أو النفسي) من لدن المراهقين يصاحب بمعدلات مرتفعة فيما يخص انتشار العديد من الاضطرابات الجسدية (الصرع، الصداع النصفي، الصداع، الإسهال / الإمساك، وعدم تحمل الغلوتين وأمراض الغدة الدرقية)، مستوى عال من الضائقة النفسية، تواتر متزايد وبشكل ملحوظ للسلوك العدواني بصفة عامة والعدوان الموجه نحو الذات والسلوكيات المعادية للمجتمع، مقارنة بحالة غياب هذه العوامل النفسية والاجتماعية السلبية.

تتمتع التلميذات بصحة جسدية وعقلية سيئة مقارنة بزملائهن من التلاميذ الذكور وأظهرن أنماطًا خاصة من السلوكيات العدوانية والمعادية للمجتمع. يحتاج المراهقون المصرحون بوجود مشاكل تعاطي الكحول عند الوالدين و / أو التعرض للإيذاء الجسدي و / أو النفسي إلى دعم مكثف مع ضرورة التلقي لرعاية صحية واجتماعية.

كلمات البحث: المراهقون، الجنس، المغرب، الصحة الجسدية، الصحة العقلية، العدوان، السلوكيات المعادية للمجتمع، تجربة الاستغلال الجسدي و / أو النفسي، مشاكل تعاطي الكحول عند الوالدين، العوامل النفسية والاجتماعية السلبية.

Acknowledgments

The following thesis wouldn't be possible without the help and the assistance of so many people who have contributed to the research in their own particular way and to whom I'm grateful and indebted.

First of all, I would like to convey my gratefulness to Professor **Nóra Kerekes** for accepting me as her master and PhD student, for her guidance, great and constant support, availability and constructive suggestions. I would like to take this opportunity to thank her also for the valuable help that she presented for me to develop myself as a researcher in the best possible way.

Really, I have been extremely lucky to have a supervisor who cared so much about my work, and who responded to my questions and queries so promptly. In addition, it is a real privilege and an honor for me to work under her supervision and to enjoy not only of her exceptional scientific knowledge but also of her extraordinary human qualities.

Professor **Meftaha Senhaji**, the first person who gave me the basic notions of scientific research, I was really lucky to benefit from her supervisions from the licentiate project until the postgraduate one. Throughout these years, Professor Senhaji has been the source of goodness, resilience, and hope from which I've pulled strength. I would like to take this opportunity to express my deepest gratitude for her critically important intellectual feedback, constructive suggestions and continuous support; it is a real privilege and honor for me to work under her supervisions and to learn from her the true meaning of love, sacrifice, sharing, and panoply of valuable human qualities.

Further, I would like to acknowledge the jury members of this thesis. I wish to express my gratitude to Professor **Mohammed Errami** for the honor to accept to be president of the jury. I am deeply grateful to all jury members, Professors **Ali Ouarour**, **Adil Najdi, and Abdellatif Bour** for agreeing to take part in the defense of this work and for accepting to read the thesis.

I feel very glad, lucky and sincerely thankful for being able to discuss and share knowledge and experience, with my co-authors. I especially wish to thank my previous Ph.D. student colleague Dr. **Anis Sfendla.** My gratitude to Professor **Maria Råstam** and Dr. **Britt Hedman Ahlström** for sharing their expertise in a generous manner. Many thanks to Mr. **Patrick Reis,** for his insight regarding English editing in all papers and the thesis. Thank goes also to the **bachelor students** who helped me with the data entry.

I would also like to thank the **Regional Directorate of the Ministry of National Education in Tétouan** for allowing me to conduct these studies, and for **the high school students** to have spending time with the completion of the survey during data collection. I would like to personally thank **the directors of the included high schools** and all **administrative staff** for their support and assistance; I have had the pleasure to cooperate with them during the internship period.

Alongside colleagues and scientific contacts, acknowledged above, I would like to thank my friends and my family especially my **mother**, my **husband**, and my **brother** whose love and guidance are with me in whatever I pursue. They are the ultimate role models. Most importantly, I wish to thank my husband Abdennour, and my wonderful child, **Ismail** who provide unending inspiration and love.

List of papers

The present thesis based on the knowledge gathered during three peer-reviewed scientific publications (referred in the text by their roman numbers).

Publications:

I. **Zouini, B.,** Sfendla, A., Senhaji, M., Råstam, M. and Kerekes, N., (2019). Somatic health and its association with negative psychosocial factors in a sample of Moroccan adolescents. *SAGE Open Medicine*, 7:1-11

II. **Zouini, B**., Sfendla, A., Hedman Ahlström, B., Senhaji, M. and Kerekes, N. (2019) Mental health profile and its relation with parental alcohol use problems and/or the experience of physical/psychological abuse in a sample of Moroccan high-school students: an explorative study. *Ann Gen Psychiatry*, 18(27): 1-8

III. **Zouini, B**., Senhaji, M. and Kerekes, N., (2019). Self-reported aggressive and antisocial behaviors in Moroccan high school students. *Psihologija*; Online First: 1-13.

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Abbreviations

- ANX: Anxiety
- AUDIT: Alcohol Use Disorder Identification Test
- BSI: Brief Symptom Inventory
- CG: Comparison Group
- DEP: Depression
- DUDIT: Drug Use Disorder Identification Test
- GSI: Global Severity Index
- HCP: High Commission for Planning
- HOS: Hostility
- INS: Interpersonal sensitivity
- ISPCAN: International Society for the Prevention of Child Abuse and Neglect
- LHA: Life History of Aggression
- LSD: Fisher's Least Significant Difference
- LTEQ: Godin Leisure-Time Exercise Questionnaire
- MeSHe: Mental and Somatic Health without borders
- OBS: Obsessive-compulsiveness
- PANAS-X30: Positive Affect and Negative Affect Schedule Expanded Form 30 items questionnaire
- PAP: Parental Alcohol use Problems
- PAR: Paranoid ideation
- PHOB: Phobic anxiety
- PPA: Physiological and/or Psychological Abuse
- PSY: Psychoticism
- SCL-90-R: brief form of the Symptom Checklist Revised
- SOM: Somatization
- SPSS: Statistical Package for the Social Sciences
- TCI: Temperament and Character Inventory
- WHO: World Health Organization

Definitions in short

Aggressive behaviors: include all behaviors that are intentionally carried out with the proximate goal of causing harm to another person who is motivated to avoid that harm (DeWall *et al*., 2012).

Antisocial behaviors: refers to actions that violate social norms in ways that reflect disregard for others or that reflect the violation of others' rights (Moffit, 1993).

Physical abuse: defined as non-accidental use of force that results in bodily injury, pain, or impairment. This includes, but is not limited to, being slapped, burned, cut, bruised, or improperly physically restrained (New York State Social Services Law, Section 473).

Psychological abuse: defined as acts done with the intention of causing emotional pain or injury (Lachs & Pillemer, 2004).

Psychological distress: refers to 'the general concept of maladaptive psychological functioning in the face of stressful life events (Abeloff *et al*., 2000, p. 556).

Somatic health: is defined as the overall physical condition of a person at a given time, the soundness of the body, freedom from disease or abnormality, and the condition of optimal physical well-being. It is when the body is functioning as it was designed to function (Kurtus, 2017).

Mental health: is "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community" (WHO, 2004).

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1. Introduction

Adolescence is a period in life characterized by some of the most intense phases of human development. During adolescence individuals form their identity, learn to control their emotions and relationships, and acquire abilities and attributes, such as self-reliance, work orientation and social commitment (Greenberger, 1984), as well as skills that are important for individual well-being (Taghizadeh *et al*., 2016). The adolescent brain is ontogenetically sculpted with a very strong adaptive function through which it adjusts to its environmental conditions (Spear, 2010), such as the adolescent's socioeconomic status, parental educational level or parental cultural needs (Brito & Noble, 2014; Noble *et al*., 2015). This plasticity of the adolescent brain is manifested in particular through substantial synaptic dynamics: some axons grow whereas others recede; new axons are created whereas others disappear (Giedd *et al*., 1999; Selemon, 2013). Different environmental effects may entail substantial and varying rewiring of the brain (known as "pruning") resulting in different cerebral organization patterns during adolescent brain development (Choudhury, 2009). In addition to the synaptic pruning process, there is an increase in the volume of the white matter in the entire brain – associated with the accelerated rate of myelination – which consequently improves the saltatory conduction of the action potentials, and therefore faster communication between brain regions (Sowell *et al*., 2003; Blakemore, 2012; Spear, 2013).

An adolescent's environmental needs and the related risk and protective factors are parts of a complex biopsychosocial matrix encompassing multiple factors, such as inherited biological determinants acting in combination with psychological, societal and cultural influences, which affect the adolescent's behavior, somatic and mental health, and overall well-being (Raine, 2002).

In Morocco, 8.9% of the population – over three million individuals – are aged between 15 and 19 years (High Commission for Planning, 2014). According to a report by the Moroccan Ministry of Health (2014), almost every second adolescent (48.9%) has a problem with insomnia, anxiety or depression. One in five children and adolescents in Morocco suffers from a mental disorder. In half of these cases the age of onset is 14 years. These numbers explain why, over the past few years, mental health has emerged as one of the main health objectives in Morocco (Moroccan Ministry of Health, 2014; OMS, 2016). This is a significant achievement as Morocco is a developing country where generally the understanding of the

importance of improving health and well-being, and of preventing ill-health, in young people is still relatively poor (Fatusi & Hindin, 2010). However, to our knowledge, no scientific studies have explored the actual health profile of Moroccan adolescents. The present study aims to fill this knowledge gap by providing a general picture of the somatic and mental health of adolescents in Morocco, by exploring and mapping the areas of 'not knowing' as regards the aggressive antisocial behaviors of high school students in Morocco. Furthermore, this thesis aims to identify the relation between parental alcohol use problems and the experience of physical and/or psychological abuse and adolescent well-being and behavior.

1.1 Adolescents

Adolescence is a period characterized by remarkable growth spurts and is strongly related to the physiological transformations of puberty. During this period, growth appears in primary and secondary sexual characteristics (changes of the genitals and changes in voice, hair, breasts, height, body shape, etc., respectively) under the impetus of hormonal changes (Rogol *et al*., 2002). The changes and signs of sexual maturation may occur and/or become evident gradually or suddenly. The appearance of these signs of sexual maturity varies from one adolescent to another, such that some adolescents may manifest these signs of maturity sooner or later than others (Stang & Story, 2005).

Besides the obvious physiological changes, adolescence is also a very dynamic period of psychological development. This period can be divided into three general stages: early adolescence (10-13 years), middle adolescence (14-17 years) and late adolescence (17-21 years) (Radzik *et al*., 2002). In early adolescence, the psychological development usually focuses on developing a new self-image in response to the adolescent's physiological changes, in addition to developing the use of newly acquired skills in terms of logical thinking and making sound judgments (Radzik *et al*., 2002). Middle adolescence is associated with increased intensity of feelings and growing importance of peer group values (Radzik *et al*., 2002). Adolescents experience emotional separation from their parents, fight for their own values, and begin to take greater control over their own activities and their educational and academic future. It is during this period that the adolescent's sense of independence and responsibility arises, as well as his or her willingness to contribute to society and to find a place therein (Ingersoll, 1992). Towards the end of late adolescence, adolescents generally have achieved a more stable sense of their identity and place in society, a vocational capacity, and an increased capacity for impulse control and social autonomy (Ingersoll, 1992).

In addition to the physical development during adolescence, the adolescent's brain wiring undergoes significant changes (pruning), many of which form the neurobiological basis for the psychological changes mentioned above. Myelin progressively isolates the axons from the brain, doubling the amount of myelin in some areas of the brain (Whitaker *et al*., 2016; Griffin, 2017). Consequently, action potentials (messages) can move at much higher rates along the axons. At the same time, the dendrites, which receive transmissions from neighboring axons, develop more branches, thus increasing their connectivity (Griffin, 2017). Synapses become stronger when used frequently; conversely, synapses progressively 'dissolve' when not used (Feinstein, 2009). Therefore, the cerebral cortex becomes thinner and more efficient. This capability for plasticity means that experience and practice play an important role in determining which synapses are eliminated and which ones are strengthened. Furthermore, it emphasizes the importance of the environment to which adolescents are exposed during the (re)modeling of their brains (Whittle *et al*., 2008).

An adolescent's life style is greatly shaped by the roles and responsibilities that he or she is expected to assume in society. Among these responsibilities we can distinguish family responsibilities. For example, adolescents may contribute significantly to household chores and responsibilities. The family responsibilities of adolescents may vary according to gender, culture and family characteristics (Gager *et al*., 1999). In addition to performing household chores, adolescents may have financial responsibilities for their families, as determined by cultural norms and socioeconomic context (Albert & Trommsdorff, 2014). In developing countries poverty and non-schooling (which are strongly correlated with each other) are the two main causes of child or adolescent labor (Johansson, 2009). In Morocco, the vast majority of children who do not attend or who have left school come from poor families (Guessous, 2002). The different responsibilities shouldered by adolescents are closely linked to their situation in terms of cultural norms, education and social expectations.

The experiences and responsibilities of adolescents determine the quality of their initial journey to their adult roles. Consequently, any developmental risks to which they are exposed during adolescence can have a profound psychological impact on their long-term development, health and well-being.

1.2 Relation between the experience of physical and/or psychological abuse and various somatic complaints, diseases and deviant behaviors

1.2.1 Physical and psychological abuse of adolescents

The World Health Organization (WHO) and the International Society for the Prevention of Child Abuse and Neglect (ISPCAN) (2006) have identified multiple factors at the individual and societal level that can contribute to the abuse or maltreatment of children and adolescents. At the individual level, the identified factors include age, gender and personal history; at the societal level, the factors include cultural norms encouraging corporal punishment and lack of social safety nets. Several researchers have pointed out the complex interplay between various risk factors for child and adolescent abuse, which are often amplified in the context of economic problems, social difficulties, low parental education, large family size, and family and/or parental stress (Lansford & Deater-Deckard, 2012; Prinz, 2016; Grasso *et al*., 2016).

Physical abuse is defined as "any nonaccidental physical injury to the child and can include striking, kicking, burning, or biting the child, or any action that results in a physical impairment of the child" (Child Welfare Information Gateway, 2016). Research from the Arab world shows that parents and educators are largely supportive of the occasional use of corporal punishment as a legitimate educational tool (Al-Mahroos, 2007; Alyahri & Goodman, 2008).

The World Health Organization (WHO) defines child maltreatment as "all forms of physical and/or emotional ill-treatment, sexual abuse, neglect or negligent treatment or commercial or other exploitation that occurs to children under 18 years of age, resulting in actual or potential harm to the child's health, survival, development or dignity in the context of a relationship of responsibility, trust or power" (WHO, 2016). Out of 28 developing and transitional countries surveyed in 2006, Yemen (92.3%), Syria (83.1%) and Iraq (79.7%) – all Arab countries – reported the highest prevalence of psychological abuse of children aged between 2 and 14 years by parents or guardians (Akmatov, 2011). Different types of abuse often co-occur. A study conducted in Saudi Arabia in 2012 found that over 5% of children and adolescents seeking protection from physical abuse also reported psychological abuse by their parents or step-parents (Saudi Arabian Health Ministry, 2012; Alsehaimi & Alshammari, 2016).

It is difficult to exactly measure the extent of child and adolescent abuse in Morocco due to the lack of a standardized national data collection system. Despite this shortcoming, there are some Moroccan associations and organizations whose main objective is the protection of the rights of children and adolescents.

1.2.2 Somatic health of adolescents and its relation to their experience of physical and/or psychological abuse

Whether the abuse is physical, psychological or emotional, it has been shown to be associated with an increase in health problems in the victims of the abuse (Felitti *et al*., 1998), including more negative perceptions of overall somatic health (Springs & Friedrich, 1992; Kaplan *et al*., 1999; Najman *et al*., 2007; Afifi *et al*., 2016). Studies have showed increased frequencies of gastrointestinal problems (Goodwin *et al*., 2003; Bonvanie *et al*., 2015), irritable bowel syndrome (Devanarayana *et al*., 2014; Grad *et al*., 2014), migraine and headaches (Felitti *et al*., 1998; Goodwin *et al*., 2003; Tietjen & Faedda, 2017; Tietjen *et al*., 2017), pain and disability (Katon *et al*., 2001, Voerman *et al*., 2015), thyroid dysfunction (Haviland *et al*., 2006), chronic fatigue syndrome (Taylor & Janson, 2002), obesity (Veldwijk *et al*., 2012), chronic lung-, liver-, and vascular diseases, and even cancer (Felitti *et al*., 1998; Afifi *et al*., 2016) in victims of physical and/or psychological abuse. The significantly decreased overall somatic health in victims of abuse was also found by Springer and colleagues (2007) who concluded that the probability of having allergies, arthritis/rheumatism, asthma, bronchitis/emphysema, circulation problems, high blood pressure, heart and liver complications, musculoskeletal complaints and ulcers was 34 to 167 percent higher in persons who had experienced physical abuse during their childhood compared to persons devoid of any such experience.

1.2.3 Mental health of adolescents and its relation to their experience of physical and/or psychological abuse

In combination with its contribution to several somatic health problems, abuse can cause a cascade of negative consequences across multiple functional domains for children and adolescents (Widom, 2000; Trickett *et al*., 2009; Gilbert *et al*., 2009). The experience of abuse has been linked to poor school performance (Maguire *et al*., 2015) and increased psychological distress (Aebi *et al*., 2015; Landolt *et al*., 2016), in addition to long-term mental health consequences such as low self-esteem, anxiety, substance abuse (Tlapek *et al*., 2017),

post-traumatic stress disorder (Kilpatrick *et al*., 2003), suicidal behaviors and depression (Kim & Lee, 2015; Infurna *et al*., 2016). Psychological abuse by parents has been associated with a range of adverse negative outcomes for young victims, including post-traumatic stress disorder (Black *et al*., 2001; Kilpatrick *et al*., 2003; Rizvi & Najam, 2014), depression (Kilpatrick *et al*., 2003; Chamberland *et al*., 2012; Rizvi & Najam, 2014), anxiety (Kilpatrick *et al*., 2003; Chamberland *et al*., 2012; Rizvi & Najam, 2014), conduct problems (Hibbard *et al*., 2012; Rizvi & Najam, 2014), obsessive-compulsiveness, attention deficit hyperactivity and oppositional defiant problems (Rizvi & Najam, 2014), personality disorders (Cohen *et al*., 2001), emotional unresponsiveness and neuroticism (Black *et al*., 2001), poor self-esteem (Cohen *et al*., 2001; Chamberland *et al*., 2012; Hibbard *et al*., 2012) and underachievement (Hibbard *et al*., 2012). In addition, it has been found that adolescents with a combined history of physical and sexual abuse show higher levels of dissociation and somatization problems than adolescents devoid of the experience of said abuse combination (Atlas *et al*., 1995; Marquis *et al*., 2016).

1.2.4 Aggressive antisocial behaviors of adolescents and its relation to their experience of physical and/or psychological abuse

Disruptive behaviors, such as aggression, opposition defiance or temper tantrums, are among the most common behavioral problems seen in children (Beauchaine *et al*., 2002). Many disruptive behaviors are part of the child's behavioral repertoire during normal development towards the end of his or her second year in life (Hay, 2005; Baillargeon *et al*., 2012). In general, the early social development of a child includes a moderate level of disruptive behavior, which decreases during early childhood as early exposure to conflict helps the child develop prosocial strategies (Tremblay, 2000; Owens & Shaw, 2003). However, some children retain their disruptive behavior throughout their childhood, which often leads to norm breaking, antisocial behaviors in adolescence and adulthood (Broidy *et al*., 2003).

From a developmental perspective, Moffitt (1993) suggests two types of antisocial behaviors: "life-course-persistent antisocial behavior" and "adolescence-limited antisocial behavior". Life-course-persistent antisocial behavior is characterized by stable and persistent aggressive and/or antisocial behavior that is usually associated with a high level of biological risk and a high-risk social environment (Moffitt, 1993; Moffitt & Caspi, 2001). The disruptive behavior of a child can be the result of inherited neuropsychological variations, such as

cognitive deficits, difficult temperament and hyperactivity, and/or of environmental risk factors, such as inadequate parenting, family discord, poverty, racism, and poor relationships with peers and teachers (Pettit, 2004; Moffitt, 2007; Farrington *et al*., 2009). Adolescence-limited antisocial behavior is characterized by aggressive and/or antisocial behavior during puberty, behavior that subsequently declines significantly in adulthood (Moffitt, 1993; Moffitt & Caspi, 2001). This type of antisocial behavior and emotional reactivity can be related to differences in the adolescent development of the limbic and prefrontal control regions of the brain (Casey *et al.*, 2008). These two brain regions have important roles in aggressive behaviors. The limbic system (the "emotional" part of the brain), mainly the projections from the amygdala, regions that are important in the initiation of the aggressive behavior and/or producing physiological changes (for example increasing blood pressure and/or heart rate) which may "drive" aggression (Sapolsky *et al.*, 2013). Justificatory evidence for this conclusion encloses:

- Neurons in the amygdala are activated during aggression;
- The levels of aggression can decrease if amygdala is damaged;
- If the amygdala is electrically stimulated, aggression take place;
- Rare tumours in the amygdala may produce aggression.

These findings are based on a massive number of studies on humans and other species (Rosell & Siever, 2015; Coccaro *et al*., 2007; Siever, 2008).

The other brain region involved in the regulation of aggression is the frontal cortex (FC) (Sapolsky *et al.*, 2013). It is more complex in humans than in other species and evolutionary it is the most recently evolved part of our brain, which fully matures through the age of 20 (Giedd *et al*., 1999; Sapolsky *et al.*, 2013). The FC is the key in executive decision-making, impulse control, long-term planning, and emotional regulation. Furthermore, it has an important role in regulating social behaviors. The capacity of FC in regulating emotions and behaviors derived from its ability to adjust the activity of amygdala (Coccaro *et al*., 2007).

Supporting evidence for this conclusion includes:

- Damage to the FC can cause increased aggressive bahavior (Anderson *et al*., 1999);
- In violent criminals a decreased metabolic rate and functioning has been found in the FC (Brower & Price, 2001; Reddy *et al*., 2018) .

In fact, during adolescence the limbic regions are more developed than the prefrontal control regions. As a result, the more mature limbic regions prevail over the prefrontal control regions during emotionally salient situations (Figure 1 from Casey *et al.*, 2008). Consequently, the combination of increased responsiveness to rewards in the limbic regions and immaturity in the behavioral control regions may predispose adolescents to seek immediate rather than long-term gains, which may explain their risk-prone decision-making, commitment to aggressive antisocial behavior, and heightened emotional reactivity (Casey *et al*., 2008).

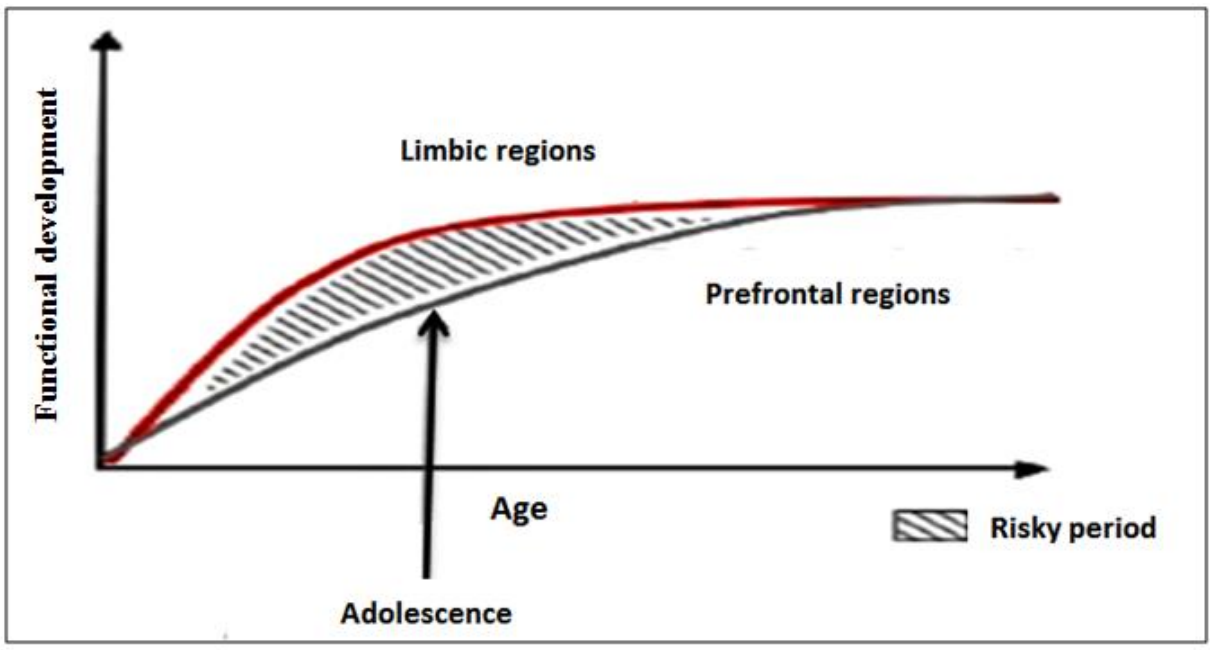

Figure 1: Model of the imbalance between limbic versus prefrontal control over behavior in adolescence (adapted from Casey *et al*., 2008 (p. 22)).

Aggressive antisocial behavior has been associated with various negative psychosocial environmental factors, such as the experience of childhood abuse, entailing the development of diverse forms of psychopathology, including impulsive and aggressive behaviors (De Bellis, 2001; Beauchaine & McNulty, 2013; Jung *et al*., 2017; Alizzy *et al*., 2017). Numerous studies have demonstrated that adolescents who have experienced abuse as children are more likely to exhibit externalizing behavior problems, such as delinquency and violence perpetration (Smith & Thornberry, 1995; Fergusson *et al*., 1996; Fergusson & Lynskey, 1997; Herrenkohl *et al*., 1997; Wolfe, 1999; Widom, 2000; Wolfe *et al*., 2001; McCabe *et al*., 2005; Moylan *et al*., 2010). Furthermore, exposure to abusive behavior may predict emotional and behavioral problems (Arslan, 2016) and aggression (Hamner *et al*., 2015). In fact, exposure to

abuse may be associated with the development of proactive aggression, due to the induced loss of empathy and imbalance of emotional reactivity in social situations (Frick *et al*., 2014). The link between the experience of abuse and the development of reactive aggression can be explained by a disruption of the adolescent's ability to regulate emotions and behavior, combined with his or her poor impulse control, leading to reactive aggression in response to real or perceived provocation (Myers *et al*., 2018).

1.3 Relation between parental alcohol use problems and the somatic and mental health problems of adolescents

1.3.1 Parental alcohol use problems

Alcohol consumption can harm both the user and other people such as family members, friends, co-workers and even people not directly connected to the user (WHO, 2018). Most of the relevant literature identifies and describes the direct effects of alcohol consumption on health (Shield *et al*., 2014; Schrieks *et al*., 2015; Connor, 2017; Kuntsche *et al*., 2017). Less research has focused on the indirect consequences of alcohol consumption within the user's family and social context. In recent years, some studies have focused on the indirect effects of alcohol consumption, for example on children living with parents with severe alcohol use problems (Rossow *et al*., 2016; Godleski *et al*., 2018; Su *et al*., 2018). These studies show that children who are growing up in this type of family environment have an increased risk of developing substance dependence, behavioral problems, and poor physical and mental health. The risk of developing said problems varies depending on which of the parents has the alcohol use problem; mother, father or both parents (Shorey *et al*., 2013; Finan *et al*., 2015). For example, Finan *et al*. (2015) found that maternal problem-drinking predicts greater drug use, rule breaking, and aggressive behaviors for girls only and greater alcohol use for boys, while paternal problem drinking predicts greater alcohol use, drug use, and aggressive behavior for boys.

However, it is very important to note that alcohol use problems are often embedded in a matrix of issues including parental mental ill-health, the family's socioeconomic status, and social networks that may affect the child's health and well-being (Ellis *et al*., 1997).

1.3.2 Somatic health of adolescents and its relation to parental alcohol use problems

Excessive alcohol use can be a serious problem in itself. The unhealthy behaviors and emotions related to alcohol use can directly affect other family members, especially children

and adolescents. Due to their immaturity and vulnerability, children and adolescents are more sensitive to the environment in which they find themselves than are adults. As a result, they may develop more negative outcomes of parental alcohol use problems than other family members.

Children of parents with alcohol use problems are at higher risk of a number of somatic health problems. An increased risk of obesity, eating disorders and/or attention deficit hyperactivity disorder (Girling *et al*., 2006; Park & Schepp, 2015), as well as of migraine, headache and/or gastrointestinal problems (Marmorstein *et al*., 2009), has been shown in children of parents with alcohol use problems, in addition to higher rates of inpatient hospital admissions for said children (Woodside *et al*., 1993). In fact, the results of these studies show that these children not only are more frequently admitted to hospital but that they also spend more days in hospital. Moreover, these children are also significantly more susceptible to certain illnesses such as mental disorders, injuries and/or poisoning than are children whose parents do not have alcohol use problems (Girling *et al*., 2006; Park & Schepp, 2015).

The negative effects of parental psychopathology on children's somatic health have also been associated with parental alcohol consumption by the affected children and adolescents themselves. Several studies show that such children and adolescents are more predisposed to alcohol consumption and even to alcohol addiction at an early age, and that their alcohol use escalates during adolescence (Sher, 1991; Chassin *et al*., 1991; Colder *et al*., 1997; Wiers *et al*., 1998; Dawson, 2000; Capaldi *et al*., 2016). The appearance of somatic health problems in children who have parents with alcohol use problems has been related to the stress that these children experience, manifested in the form of family conflicts, neglect, and an increased number of stressful and traumatic life events (Dube *et al*., 2001; Velleman & Templeton, 2007; Kelley *et al*., 2007; Nodar, 2012; Kelley *et al*., 2015; Thompson *et al*., 2017).

1.3.3 Mental health of adolescents and its relation to parental alcohol use problems

The life style of the parents has a significant effect on the well-being of the adolescent (Milevsky *et al*., 2007). Children of parents with substance use disorders often grow up under severe stress and are at greater risk of developing psychological problems. The results of several studies show that adolescent children of parents with alcohol use disorders report higher levels of depression and anxiety, and present more symptoms of generalized stress, than do adolescent children whose parents do not have alcohol use disorder (Reich *et al*.,

1993; Earls *et al*., 1998; Chassin *et al*., 1999; Jiloha, 2002; Stanley & Vanitha, 2008; Hussong *et al*., 2008). In addition, adolescents with parents who have alcohol use disorder are at increased risk of developing substance (alcohol and drugs) use disorders themselves (Windle, 1996; Handley & Chassin, 2013). A link between parental problematic alcohol use and adolescents' mental ill-health has been identified among both boys and girls (Obot & Anthony, 2004; Balsa *et al*., 2009; Park & Schepp, 2015).

This link can be explained by means of a psychobiological model in which the risk of genetic predisposition to psychiatric disorders in children of parents with substance use disorder is combined with the effects of a negative psychosocial family environment and an absence of healthy parenting (Latendresse *et al*., 2008; King *et al*., 2009; Yule *et al*., 2013).

1.3.4 Aggressive antisocial behavior of adolescents and its relation to parental alcohol use problems

Parental alcohol use problems have been found to be associated with conduct and emotional problems (Christensen & Bilenberg, 2000), and with a variety of internalizing and externalizing behaviors during childhood or adolescence (Hussong *et al*., 2008; Hussong *et al*., 2010). Children of parents with alcohol use problems have an increased risk of confronting more stressful life events such as family conflicts and neglect (Chassin *et al*., 1991; Sher *et al*., 1997). These stressful life events may mediate the relation between parental alcohol use problems and adolescents' externalizing symptoms which are often characterized by hyperactivity and antisocial aggressive behavior (Chassin *et al*., 1991; Chassin *et al*., 1993).

Previous research has highlighted the link between childhood and adolescent aggression and parental problem-drinking (Marmorstein *et al*., 2009; Hussong *et al*., 2010), and has showed that children who live with an alcohol-dependent parent or have a parent with an alcohol use disorder score higher on delinquent and aggression behavioral scales than do children who do not live with an alcohol-dependent parent (Barnow *et al*., 2002; Obot & Anthony, 2004).

2. AIMS

The overall aim of the present thesis was to study the self-reported somatic and mental health, and aggressive and antisocial behaviors, of a sample of Moroccan high school students.

- ***Specific aims:***

1- Investigate the prevalence of defined self-reported somatic symptoms/disorders in a sample of Moroccan high school students **(Paper I)**.

2- Define the prevalence of self-reported somatic complaints in high school students who report parental alcohol use problems and/or the experience of physical and/or psychological abuse **(Paper I)**.

3- Describe the self-reported psychological distress level in a sample of Moroccan high school students **(Paper II)**.

4- Investigate on the self-reported data the relation between parental alcohol use problems and/or the experience of physical and/or psychological abuse and the adolescents' mental health complaints **(Paper II)**.

5- Define the level, type and gender-specific distribution of self-reported aggressive and antisocial behaviors in a sample of Moroccan high school students **(Paper III)**.

6- Identify the relation between negative psychosocial factors and the aggressive antisocial behaviors of adolescents **(Paper III)**.

3. Subjects and Methods

3.1 Project design: The MeSHe study

The "Mental and Somatic Health without borders" (MeSHe) project (http://meshe.se) is an international project focusing on culture-specific patterns of mental health profiles coupled to substance abuse and aggressive antisocial behaviors in adolescents. The MeSHe project assesses information by means of a standardized self-reported anonymous survey (the MeSHe survey).

The MeSHe survey includes:

- a detailed background questionnaire assessing age, gender, the presence of clinically diagnosed somatic and mental health problems, and a number of psychosocial factors; and
- seven previously validated questionnaires:
  - ***Life History of Aggression scale*** (LHA): The LHA (Coccaro *et al*., 1997) measures the occurrence of aggressive and antisocial behaviors since the age of 13. It consists of 11 items, constituting the LHA total scale, distributed over three subscales: Aggression subscale, Antisocial Behavior subscale, and Self-Directed Aggression subscale.
  - ***Brief Symptom Inventory*** (BSI): The BSI is a self-reported measure of psychological distress (Derogatis & Spencer, 1982). The BSI contains 53 items distributed over nine primary symptom dimensions of distress (somatization, obsessive-compulsiveness, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) and three global indices of distress (the General Severity Index, the Positive Symptom Distress Index and the Positive Symptom Total).
  - ***Alcohol Use Disorder Identification Test*** (AUDIT): The AUDIT (Bohn *et al*., 1995; Babor *et al*., 2001) is a 10-item screening tool developed by the World Health Organization (WHO) to assess alcohol consumption, drinking behaviors, and alcohol-related problems over the last 12 months.
  - ***Drug Use Disorder Identification Test*** (DUDIT): The DUDIT assesses an individual's illicit drug use and related consequences over the past year (Berman

et al., 2004). The DUDIT was developed as a parallel instrument to the AUDIT and consists of 11 items that identify use patterns and various drug-related problems.

- ***Positive Affect and Negative Affect Schedule Expanded Form 30 items questionnaire*** (PANAS-X30): The PANAS-X30 (Watson *et al*., 1988) consists of 30 items that measure two general affective state dimensions distributed over four dimensions: positive affect (activated and deactivated) and negative affect (activated and deactivated).
- ***Godin Leisure-Time Exercise Questionnaire*** (LTEQ): The LTEQ (Godin & Shephard, 1985; Godin, 2011) is a self-rated instrument that measures normal leisure-time physical activity during no specific time frame (the subject simply estimates a normal 7-day period). The LTEQ consists of a 3+1-item scale for assessing the intensity and frequency of the physical activity.
- ***Temperament and Character Inventory*** (TCI); The TCI (Cloninger *et al*., 1993) is based on a psychobiological model that attempts to explain the causes of individual differences in personality traits. The TCI consists of seven dimensions of personality traits: four temperaments (Novelty Seeking, Harm Avoidance, Reward Dependence, and Persistence) and three characters (Self-Directedness, Cooperativeness, and Self-Transcendence).

In this study, we have used the Arabic version of the MeSHe survey. In the following section, the measures used in the present thesis are described in detail.

3.2 Measures

3.2.1 MeSHe background questionnaire (Papers I,II and III)

The MeSHe background questionnaire used for this study's respondents (Moroccan adolescents) included information about the respondents' age, gender, weight and height, high school level (first, second or third year) and program (science or literature and human sciences). The respondents' medical history was assessed through self-reports of the presence of clinically diagnosed somatic and/or mental disorders. The respondent's age at the time of the diagnosis was requested.

The background section of the MeSHe survey also contained items about psychosocial factors. Two of these items were stated as follows: "Have you ever been physically and/or psychologically abused?" and "Do you have a parent who has problems with alcohol?".

Based on their answers to these two questions the adolescents were classified into either of four groups:

- Adolescents not reporting having parents with alcohol use problems nor the experience of being abused (comparison group: CG).
- Adolescents reporting having Parents with Alcohol use Problems (PAP group).
- Adolescents reporting the experience of Physical and/or Psychological Abuse (PPA group).
- Adolescents reporting both Parental Alcohol use Problems and the experience of Physical and/or Psychological Abuse (PAP+PPA group).

The MeSHe background questionnaire includes the survey about self-declared somatic complains were developed by the project leader (NK) based on a similar questionnaire in the Child and Adolescent Twin Study in Sweden (Alabaf *et al*., 2018). The test-retest reliability of the MeSHe somatic health questionnaire was tested in a class of high-school students (n=31), with a two-week interval. No significant differences in the reports in any of the items could be detected (p-values between 0.34 and 0.97), which result indicates an acceptable test-retest reliability.

3.2.2 Brief symptom inventory– BSI (Paper II)

The Brief Symptom Inventory (BSI) is a brief form of the Symptom Checklist Revised (SCL-90-R) (Derogatis, 1975), a self-reporting inventory developed to measure the degree of psychological distress (Derogatis & Spencer, 1982). The BSI has been translated into several languages, including Arabic (Abdallah, 1998, Rudwan, 2000). The responding adolescents rated the general influence of each item during the past year on their well-being.

The BSI contains 53 items, each of which is rated on a five-point Likert scale ranging from 0 (“not at all”) to 4 (“extremely”). Nine primary symptom dimensions of distress are assessed within the BSI, namely somatization (SOM), obsessive-compulsiveness (OBS), interpersonal sensitivity (INS), depression (DEP), anxiety (ANX), hostility (HOS), phobic anxiety (PHOB), paranoid ideation (PAR), and psychoticism (PSY). In addition to the nine symptom dimensions, three global indices of distress: Global Severity Index, Positive Symptom Distress Index, and Positive Symptom Total can be calculated (Derogatis & Melisaratos, 1983). In the present study only the Global Severity Index (GSI), an indicator of the current overall level of distress was calculated.

The nine primary symptom dimensions were defined in the original article (Derogatis & Melisaratos, 1983) and are as follows:

- **Somatization**: Feelings of muscular aches and pain ("feeling weak in parts of your body", "numbness or tingling in parts of your body", "feeling heavy in arms or legs") and complaints coupled to the cardiovascular ("pains in the heart or chest"), gastrointestinal ("nausea or upset stomach") or respiratory system ("trouble catching your breath") and lightheadedness ("faintness or dizziness").
- **Obsessive-compulsiveness**: Needing to repeatedly verify one's actions ("having to check and double check what you do", "difficulty in making decisions") and experiencing memory and concentration problems ("trouble remembering things", "feeling blocked in getting things done", "your mind going blank", "trouble concentrating").
- **Interpersonal sensitivity**: Feelings of increased sensitivity ("your feelings are easily hurt", "feelings that people are unfriendly or dislike you") and inferiority ("feeling inferior to others", "feeling very self-conscious with others") during intrapersonal interactions.
- **Depression**: Prevalent dysphoric affect and mood ("feeling lonely", "feeling blue", "feeling no interest in things"), feelings of hopelessness and uselessness ("feeling hopeless about the future", "feelings of worthlessness") and suicidal thoughts ("thoughts of ending your life").
- **Anxiety**: Feelings of fear ("spells of terror or panic", "feeling fearful", "suddenly scared for no reason"), nervosity and restlessness ("nervousness or shakiness inside", "feeling so restless you cannot sit still", "feeling tense or keyed up").
- **Hostility**: Being easily irritable and annoyed ("feeling easily annoyed or irritated", "temper outbursts that you cannot control", "getting into frequent arguments") and experiencing urges to carry out physical aggression ("having urges to beat, injure or harm someone", "having urges to break or smash things").
- **Phobic anxiety**: Feelings of fear in particular spaces ("feeling afraid in open spaces", "feeling afraid to travel on buses, subways or trains", "having to avoid certain things, places or activities because they frighten you") or when among people or being alone ("feeling uneasy in crowds", "feeling nervous when you are on your own").
- **Paranoid ideation**: Feelings of fear and suspiciousness towards other people ("feeling that most people cannot be trusted", "feeling that you are watched or talked about by others", "others not giving you proper credit for your achievements", "feeling that

people would take advantage of you if you let them") and projection ("feeling that others are to blame for most of your troubles").

- **Psychoticism**: Feelings of social alienation ("the idea that someone else can control your thoughts", "feeling lonely even when you are with people", "never feeling close to another person"), fear for one's own sanity ("the idea that something is wrong with your mind") and fear of punishment ("the idea that you should be punished for your sins").

In addition to psychiatric outpatients and inpatients, the BSI is also used in non-psychiatric adult populations (Aroian *et al*., 1995; Gilbar & Ben-Zur, 2002) and adolescents (Canetti *et al*., 1994). Acceptable and good validity, as well as the reliability measures, have been established (Derogatis & Cleary, 1977; Hoe & Brekke, 2009). In the present study the Arabic version of BSI (Rudwan, 2000) was used, with acceptable (0.71) to good (0.85) internal reliability in all the primary symptom dimensions.

3.2.3 Life History of Aggression – LHA (Paper III)

The Life History of Aggression (LHA) scale (Coccaro *et al*., 1997) measures the occurrence of aggressive and antisocial behaviors since the age of 13. The translations of LHA inventory were performed in two steps: first, the LHA was translated from English into Arabic; second, the Arabic translation was back-translated into English by an independent translator. In 2014, after making several adjustments, the project leader (NK) in addition to the MeSHe team approved a final version of the Arabic LHA.

The LHA total scale consists of three subscales:

- A five-item Aggression subscale (measuring temper tantrums, verbal aggression, fighting, physical assault and destruction of property);
- A four-item Antisocial Behavior subscale (assessing school behavioral problems, problems with supervisors, antisocial behavior not involving the police, and antisocial behavior involving the police);
- A two-item Self-Directed Aggression subscale (reporting suicidal and self-harm behavior).

All items are scored on a six-point Likert scale based on the total number of occurrences of the behavior. The scores are coded as follows: 0 (no occurrences), 1 (one

occurrence), 2 (two or three occurrences), 3 (four to nine occurrences), 4 (ten or more occurrences), or 5 (more occurrences than can be counted).

In Coccaro *et al*., (1997) study, Cronbach's alpha for the LHA Total score was 0.88. Alpha coefficients for The Aggression and the Antisocial Behavior, and Self-Directed Aggression subscales were 0.87, 0.74, and 0.48, respectively.

3.3 Study population

The study was done in Tetouan, a city in northern Morocco. During the 2013/14 school year, data were collected from one high school (Charif Idrissi High School), which had a total of 50 10^{th}, 11^{th} and 12^{th} grade classes. From each grade, four classes were conveniently chosen to participate in the study. In these 12 classes, there were 456 students of which 280 (61%) completed the survey. Data collection continued during the 2014/15 school year, now including three additional high schools in the study (in each case, the study was authorized by the appropriate high school director). These four high schools had a total of 97 10^{th}, 11^{th} and 12^{th} grade classes. Two classes from each grade and from each school were conveniently selected to participate in the study. In these 24 classes, there were 876 students of which 375 (43%) completed the survey **(Papers I, II and III)** (Table 1).

Table 1: Overview of sampling during the Academic years of 2013-14 and 2014-15

Number of	2013/2014		2014/2015	
	Total	Selected	Total	Selected
High schools implicated in the study	17	1	17	4
Classes in these high schools	50	12	97	24
High school students in these classes	456	280	876	375

The study population of **Paper I** included 655 students (315 males and 340 females) from conveniently selected 10^{th}, 11^{th} and 12^{th} grade classes in four high schools (data collection during 2013/14 and 2014/15). This study sample represented a conveniently selected 4.2% of the total high school student population in the city of Tetouan at the time.

The study population of **Papers II and III** included 375 students (170 males and 205 females) from conveniently selected 10^{th}, 11^{th} and 12^{th} grade classes in four high schools. This study sample represented a conveniently selected 2.42% of the total high school student population in the city of Tetouan at the time.

Table 2 displays the basic characteristics of the study populations of Papers I, II and III.

Table 2: Basic characteristics of the study populations

		Paper I "(Somatic health)" (N=655)	**Papers II and III** (Mental health)" (N=375)
Number of students	Male	315 (48.1%)	170 (45.3%)
	Female	340 (51.9%)	205 (54.7%)
Age of students	Mean (SD)	16.64 (1.0)	16.56 (1.04)
	Median	17	16
	Range	15-18	15-18
Distribution by grade	10^{th}	38.2%	52.8%
	11^{th}	43.8%	30.1%
	12^{th}	18%	16%
Distribution by program	Science	62.8%	48%
	Literature and human sciences	37.2%	52%

3.4 Statistical methods

The data used in the present thesis were coded in the Statistical Package for the Social Sciences (SPSS) 21.0 (IBM) software tool. The research team performed data entry, coding and processing. All the analyses were two-tailed and the significance level was defined at $p < .05$.

- The Chi-Square test was applied to ascertain the test-retest reliability of the MeSHe background questionnaire and to test the relation between group membership (CG, PAP, PPA or PAP+PPA) and the prevalence of defined somatic symptoms and diseases **(Paper I)**.
- The strength of the statistically significant relationship was evaluated using Cramer's V effect size with the following values: values from 0.07 to 0.20 indicating a small effect, values from 0.21 to 0.35 indicating a medium effect, and values from 0.36 suggesting a large effect (Gravetter & Wallnau, 2004) **(Paper I)**.
- Contingency square analysis was performed to assess the relationship between somatic symptoms and diseases, on the one hand, and psychosocial variable groups, on the other. Adjusted z-scores were calculated and transformed to chi-square (by multiplying them by each other). Corrections for Type I errors were made using Bonferroni correction (MacDonald & Gardner, 2000; Garcia-Perez & Nunez-Anton,

2003) setting the significance cut-off at α/n (0.05/4 = 0.0125), where n refers to the number of compared groups **(Paper I)**.

- The calculated scores were not normally distributed (Kolmosorov-Smirnov test' significance <0.05). Therefore, non-parametric statistical analyses were used:
  - The Mann-Whitney U-test was used to compare the scores of male and female students **(Papers II and III)**.
  - The Kruskal-Wallis H-test was applied to compare the means ranks between the adolescents belonging to the different groups (CG, PAP, PPA or PAP+PPA) **(Papers II and III)**.
  - Post hoc (Fisher's Least Significant Difference; LSD) tests were applied for multiple testing regarding the differential interactions between the student groups **(Papers II and III)**.

4. Ethical consideration

The MeSHe survey was designed in accordance with the Helsinki Declaration (World Medical Association, 1964). Its completion during this study was voluntary and anonymous. All study participants received a short written and oral presentation of the MeSHe project and its aims, and were given an opportunity to discuss their queries regarding the project, or their participation therein, with a responsible researcher. The participants were told that they were free to leave the classroom at any time if they did not wish to participate in the study. The students were ensured that their answers, their participation or rejection of participation, would have no effect on their personal file. The data were collected on anonymous survey sheets pursuant to a collection process guaranteeing anonymity. Completion of the survey was considered as consent to participate. The survey was approved, with the registration number 85, by the Regional Directorate of the Ministry of National Education in Tetouan, which is responsible for managing and directing all matters concerning all students, from primary through high school, in Tetouan province, and by the Faculty of Science at Abdelmalek Essaâdi University. The implementation of the survey was approved by each of the four concerned high school directors and by the relevant parent association.

5. Results

5.1 Somatic health and its relation to negative psychosocial factors in a sample of Moroccan high school students (Paper I)

5.1.1 Prevalence of somatic health problems

The most prevalent somatic problem among the surveyed Moroccan high school students was headaches, which was reported by 57.5% of the total sample (51.8% in males, 62.8% in females), followed by problems with diarrhea and/or constipation, reported by 30.3% (22.6% in males, 37.8% in females), and allergy (24.6%; 19.3% in males, 29.6% in females). The detailed prevalence of the assessed somatic symptoms and diseases are presented in Figure 2.

In general, the female high school students of the sample study significantly more often reported headaches ($p = 0.002$), allergy ($p = 0.02$) and diarrhea/constipation ($p = 0.001$) than did the male students. However, these significances had only a small effect size. The prevalence of epilepsy, diabetes and cancer were low (3.2%, 1.9% and 1.3%, respectively), and 1.1% of the students (two male and five female students) reported a diagnosis of tuberculosis.

The percentage of the male students in the sample study (34.7%) who reported having none of the defined somatic symptoms or diseases was significantly higher than that of the female students (24.3%) reporting no somatic complaints.

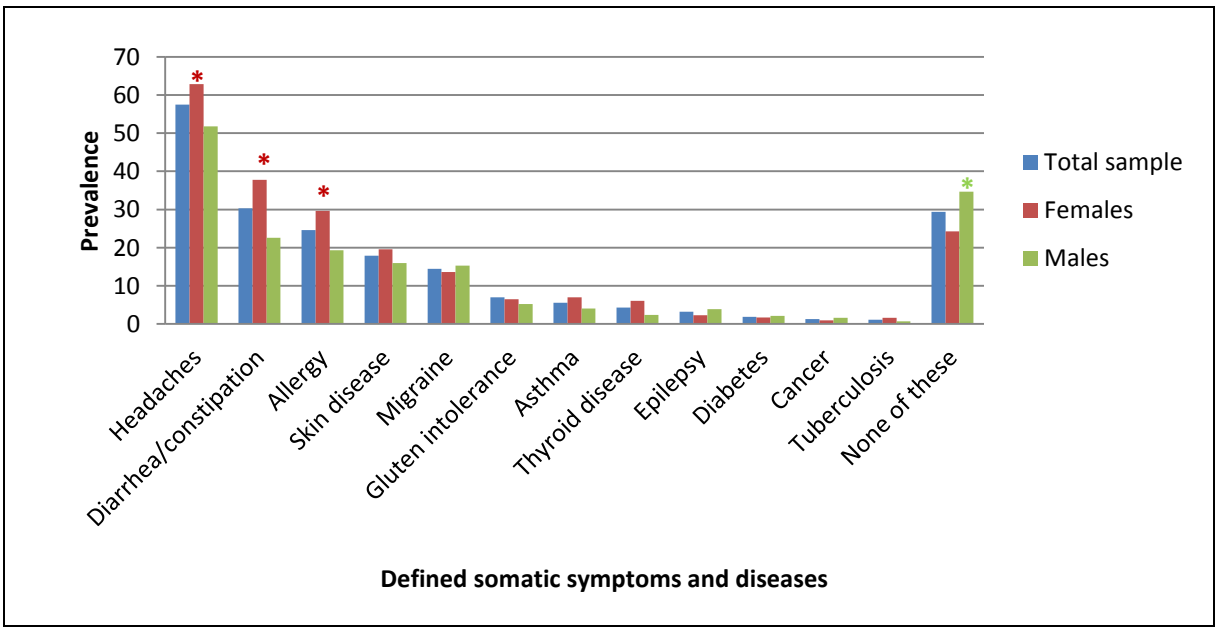

Figure 2: Prevalence of defined somatic symptoms and diseases in a sample of Moroccan high school students (N=655)
* = p<0.05, Significant difference between genders

5.1.2 Somatic complaints in a sample of adolescents reporting parental alcohol problems and/or the experience of being abused

Of the 655 students participating in this study, 42 (6.4%) did not answer one or both of the two previously cited questions about negative psychosocial factors. Of the remaining 613 students 44 (7.2%) answered "Yes" to both questions. The answers of the remaining 569 students were classified into three groups: Students not reporting having parents with alcohol problems neither the experience of being abused (comparison group: CG) (n = 407); students reporting having Parents with Alcohol Problems (PAP) (n = 61); and students reporting the experience of Physical and/or Psychological Abuse (PPA) (n = 101).

The comparison of the frequencies of somatic complaints between the four groups (CG, PAP, PPA, and PAP+PPA) revealed significant differences (Figure 3). The prevalence of migraine ($\chi2$ (3, n = 571) = 86.37, p < 0.001)) differed between the groups with large effect size, the prevalence of headaches ($\chi2$ (3, n = 563) = 31.06, p < 0.001), diarrhea/constipation ($\chi2$ (3, n = 528) = 33.36, < 0.001), gluten intolerance ($\chi2$ (3, n = 568) = 32.97, p < 0.001), and thyroid disease ($\chi2$ (3, n = 591) = 32.95, p < 0.001) differed between the groups with moderate effect sizes, and the prevalence of skin disease ($\chi2$ (3, n = 578) = 9.27, p = 0.03) and epilepsy ($\chi2$ (3, n = 569) = 14.05, p = 0.003), each differing with a small effect size (Figure 3).

For students in the PPA group the risk of having somatic complaints increased significantly for many diseases. The risk of having thyroid disease was eight times higher (RR: 8.11, p < 0.001) for them, while having complaints for migraine, epilepsy and gluten intolerance each increased about five times (RRs: 5.19, 5.1, 4.65; p < 0.001, 0.001, < 0.001 respectively), and the risk of having skin disease almost doubled (RR: 1.78, p=0.006) for these students. The risk that these adolescents (PPA) also have diarrhea/constipation problems and headache increased about 50% (RRs: 1.56, 1.53; p=0.005, < 0.001; respectively).

This risk of having any of these somatic complaints did not increase significantly in those students who belonged to the PAP group except of the risk of headaches (p=0.008), which was increased with about 40% (RR = 1.38).

For those who reported the existence of both negative psychosocial problems (PPA+PAP group) the risk of having somatic complaints increased also significantly for many diseases. The risk of having migraine was seven times higher (RR: 7.3, p < 0.001), the risk of having epilepsy was almost five times (RRs: 4.6, p =0.02) and thyroid disease four times (RRs: 3.89, p =0.03) increased, while having problems with diarrhea/constipation was almost

three times higher (RR: 2.8, $p < 0.001$), and the risk of headaches was almost doubled (RR: 1.56, p= 0.001) for the high school students belonging to PPA+PAP group.

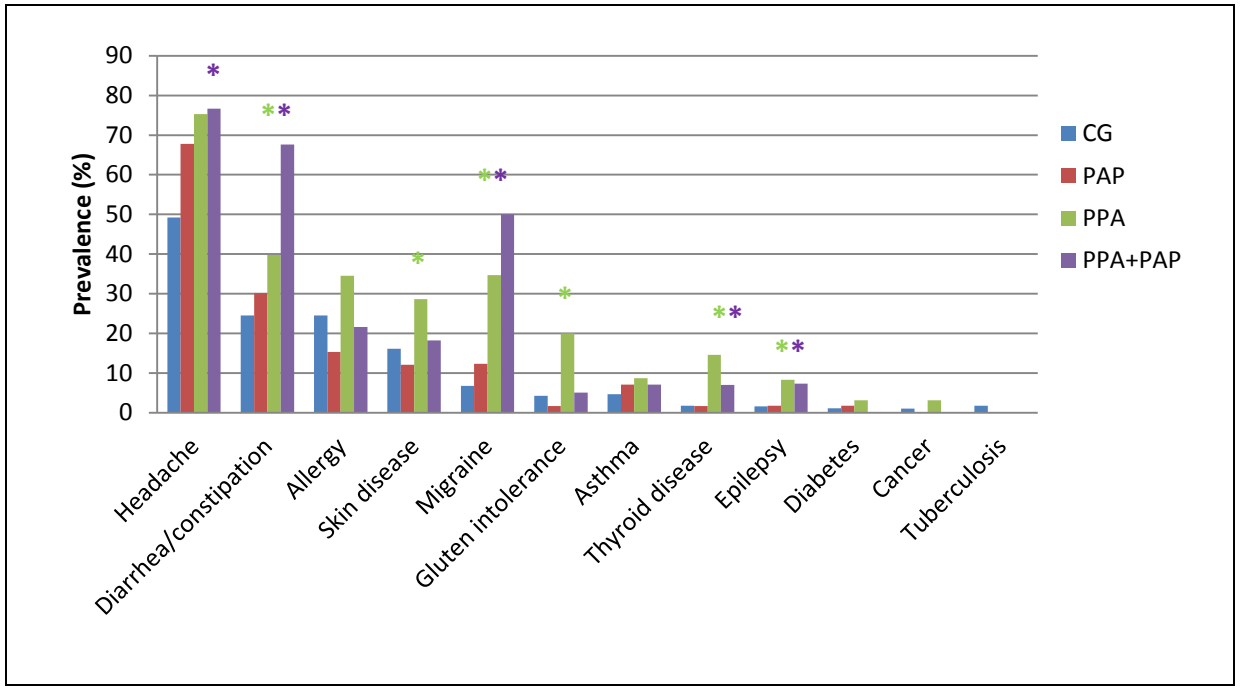

Figure 3: Prevalence of defined somatic symptoms in a sample of Moroccan high school students according to psychosocial variable groups.
CG = Comparison Group
PAP = Adolescents reporting Parental Alcohol use Problems
PPA = Adolescents reporting the experience of Physical and/or Psychological Abuse
PAP+PPA = Adolescents reporting both PAP and PPA
* = p<0.05; Significant difference between the specific psychosocial group and CG.

Post hoc comparisons (Table 3) revealed that the adolescents belonging to the CG reported significantly fewer problems with diarrhea/constipation ($\chi2$ (3, n = 528) = 18.32, $p < 0.001$), migraine ($\chi2$ (3, n = 571) = 58.68, $p < 0.001$), headaches ($\chi2$ (3, n = 563) = 30.03, $p < 0.001$) and thyroid disease ($\chi2$ (3, n = 591) = 17.39, $p < 0.001$) than did the adolescents in the other groups. Furthermore, the students reporting the experience of physical and/or psychological abuse were significantly more likely to have migraine ($\chi2$ (3, n = 571) = 53.4, $p < 0.001$), headache ($\chi2$ (3, n = 563) = 13.84, p = 0.003), gluten intolerance ($\chi2$ (3, n = 568) = 32.38, $p < 0.001$) or thyroid disease ($\chi2$ (3, n = 591) = 30.36, $p < 0.01$) than were the students not reporting parental alcohol use problems or those reporting neither of the two psychosocial problems. In addition, the adolescents reporting both of the psychosocial problems (PAP+PPA group) were significantly more likely to have migraine ($\chi2$ (3, n = 571) = 39.56, $p < 0.001$) and diarrhea/constipation problems ($\chi2$ (3, n = 528) = 25.81 $p < 0.001$) than were the students belonging to the CG, PAP or PPA groups (Table 3).

Table 3: Post hoc analyses for the prevalence of defined somatic symptoms and diseases according to psychosocial variable groups

		CG (*n*=407)	PAP (*n*=61)	PPA (*n*=101)	PAP+PPA (n=44)
Epilepsy	Adjusted Z scores	-2.96	-0.64	3.17	1.58
	χ^2	8.76	0.41	10.05	2.5
	p-value	0.03	0.94	0. 02	0.48
Migraine	Adjusted Z scores	-7.66	-0.58	5.95	6.29
	χ^2	58.68	0.34	53.4	39.56
	p-value	<0.001	0.95	<0.001	<0.001
Headache	Adjusted Z scores	-5.48	1.71	3.72	2.67
	χ^2	30.03	2.92	13.84	7.13
	p-value	<0.001	0.4	0.003	0.68
Diarrhea/constipation	Adjusted Z scores	-4.28	0.43	2.69	5.08
	χ^2	18.32	0.18	7.24	25.81
	p-value	<0.001	1	0.26	<0.001
Gluten intolerance	Adjusted Z scores	-3.25	-1.6	5.69	-0.4
	χ^2	10.56	2.56	32.38	0.16
	p-value	0.14	0.46	<0.001	0.98
Skin disease	Adjusted Z scores	-1.52	-1.21	2.92	0.07
	χ^2	2.31	1.46	8.53	0.005
	p-value	0.51	0.69	0.036	1
Cancer	Adjusted Z scores	-0.5	-0.9	1.89	-0.74
	χ^2	0.25	0.81	3.57	0.25
	p-value	0.97	0.85	0.31	0.91
Diabetes	Adjusted Z scores	-0.97	0.26	1.58	-0.8
	χ^2	0.94	0.07	2.5	0.64
	p-value	0.81	0.99	0.48	0.89
Asthma	Adjusted Z scores	-1.56	0.48	1.33	0.41
	χ^2	2.43	0.23	1.77	0.17
	p-value	0.49	0.97	0.62	0.98
Allergy	Adjusted Z scores	-0.3	-1.82	2.25	0.48
	χ^2	0.09	3.31	5.06	0.23
	p-value	0.99	0.35	0.17	0.97
Thyroid disease	Adjusted Z scores	-4.17	-1.02	5.51	0.93
	χ^2	17.39	1.04	30.36	0.86
	p-value	<0.001	0.79	<0.001	0.83
Tuberculosis	Adjusted Z scores	1.88	-0.89	-1.17	-0.74
	χ^2	3.53	0.79	1.37	0.55
	p-value	0.32	0.85	0.71	0.91

Significance level set at $p < 0.0125$ after Bonferroni adjustment
CG = Comparison Group
PAP = Adolescents reporting Parental Alcohol use Problems
PPA = Adolescents reporting the experience of Physical and/or Psychological Abuse
PAP+PPA = Adolescents reporting both PAP and PPA

5.2 Mental health and negative psychosocial factors in a sample of Moroccan high school students (Paper II)

5.2.1 Mental health

Generally, in our study population, the Moroccan female high school students reported higher psychological distress levels when compared to the male students. The female students scored significantly higher on each primary symptom dimension, with the exception of the "hostility" dimension where no significant difference was measured between the genders. The generally higher psychological distress in the female students was also reflected in their significantly higher General Severity Index (GSI) score. Figure 4 summarizes the mean values for each primary symptom dimension of the BSI and for the GSI in this study's Moroccan high school student sample.

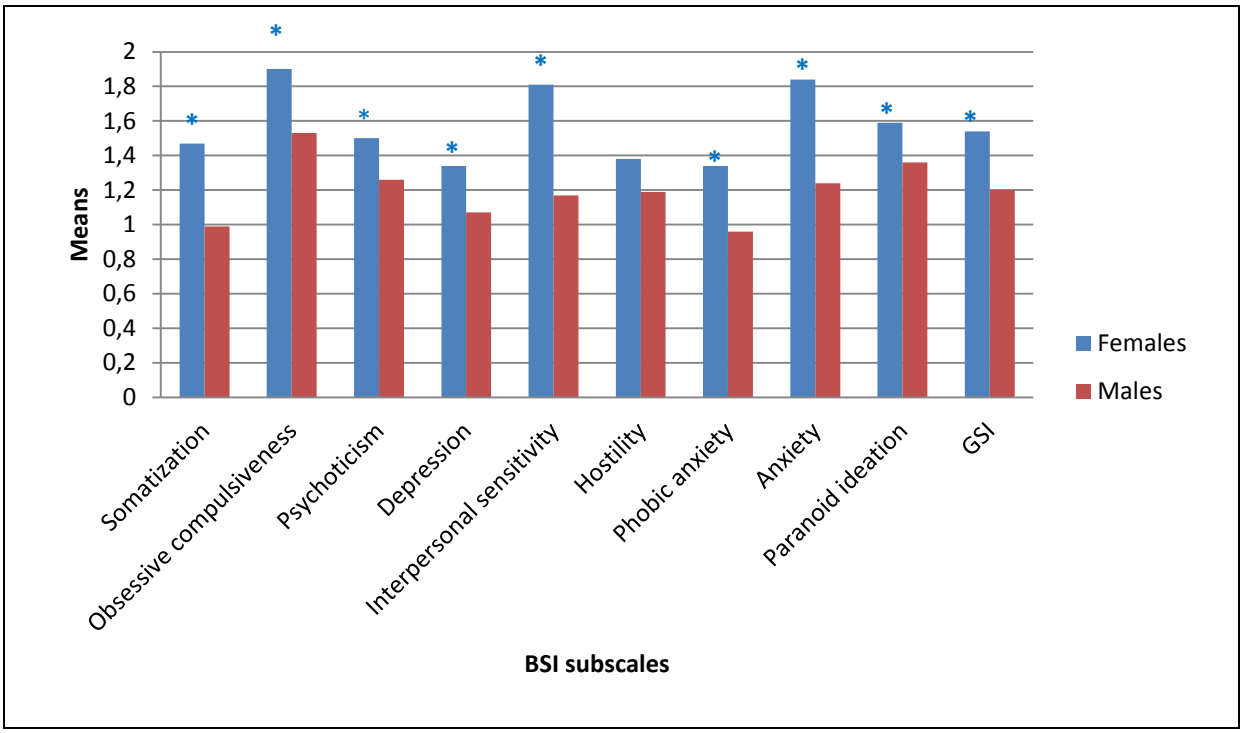

Figure 4: Self-reported mental problems in a sample of Moroccan adolescents (N=375).

GSI = General Severity Index
* = $p<0.05$, Significant difference between genders

5.2.2 Mental health of Moroccan high school students reporting alcohol problems of their parents and/or the experience of physical and/or psychological abuse

Of the 375 high school students participating in this study, 18 did not answer one or both questions about negative psychosocial factors in their life, and were consequently excluded from the comparison analyses between groups. The answers of the remaining 357 students were classified into either of four groups: students not reporting having parents with

alcohol use problems nor the experience of being abused (CG, n = 250); students reporting having Parents with Alcohol use Problems (PAP, n = 33); students reporting the experience of Physical and/or Psychological Abuse (PPA, n = 55); and students reporting both having Parents with Alcohol use Problems and experience of Physical and/or Psychological Abuse (PAP+PPA, n = 19). There were significantly more male than female students reporting parental alcohol use problems (11% of the males and 7.8% of the females, p = 0.002), or reporting both parental alcohol use problems and the experience of physical and/or psychological abuse (9.8% of the males and 1.6% of the females, p = 0.03), while there were more female than male students reporting the experience of physical and/or psychological abuse, although this difference did not reach the significance level (13.4% of the males and 17.1% of the females, p = 0.36). Because of the differences in the gender distribution in response to these questions, the level of psychological distress was analyzed separately.

In the PAP group (in both the male and female students), the scores for the nine primary BSI symptom dimensions, as well as for the GSI, did not differ significantly from the scores of the CG group (Figures 5 and 6).

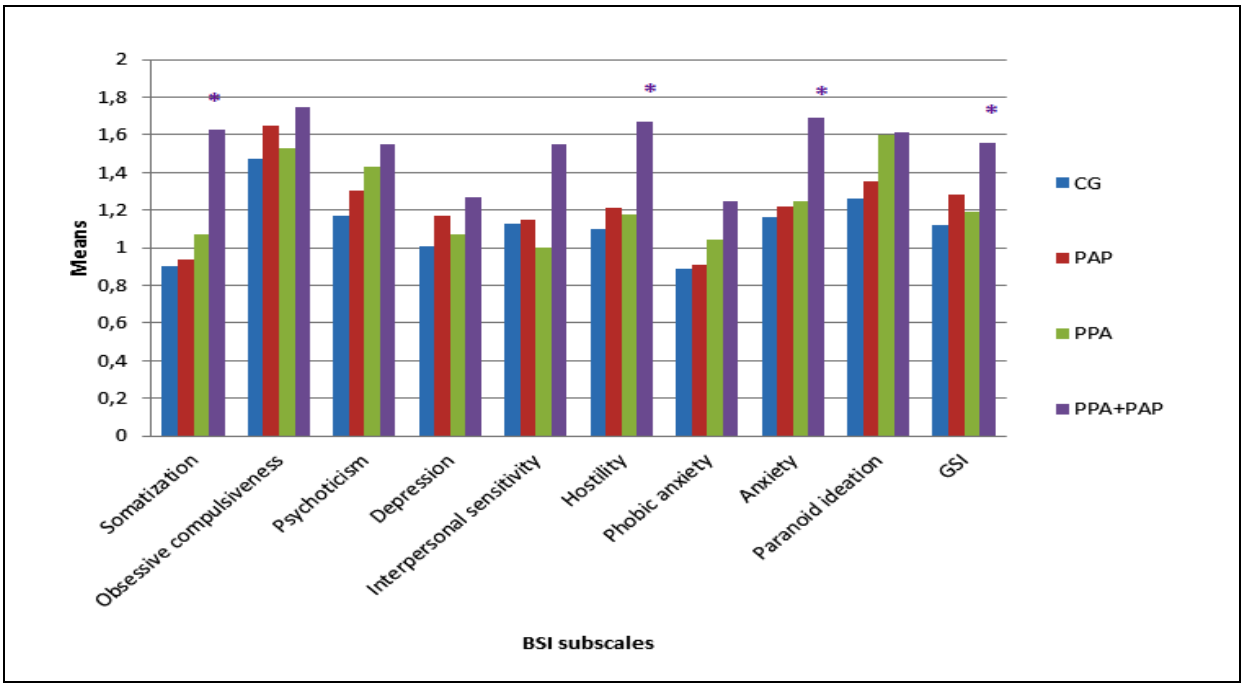

Figure 5: Self-reported psychological distress in a sample of Moroccan adolescent males according to psychosocial variable groups.
CG = Comparison Group
PAP = Adolescents reporting Parental Alcohol use Problems
PPA = Adolescents reporting the experience of Physical and/or Psychological Abuse
PAP+PPA = Adolescents reporting both PAP and PPA
* p<0.05, Significant difference between the specific psychosocial groups and CG

The male students who reported both parental alcohol use problems and the experience of physical and/or psychological abuse (PAP+PPA group) scored significantly higher on the somatization, hostility and anxiety primary symptom dimensions, as well as on the GSI, than did the male students not reporting any of these problems (CG) (Figure 5).

The female students in the PPA group scored significantly higher in the somatization, obsessive-compulsiveness, psychoticism and anxiety primary symptom dimensions compared to the female students in the CG. The PPA group female students also indicated significantly higher distress levels in the depression and hostility primary symptom dimensions, as well as in the GSI, compared to the female students in both the CG and PAP groups (Figure 6).

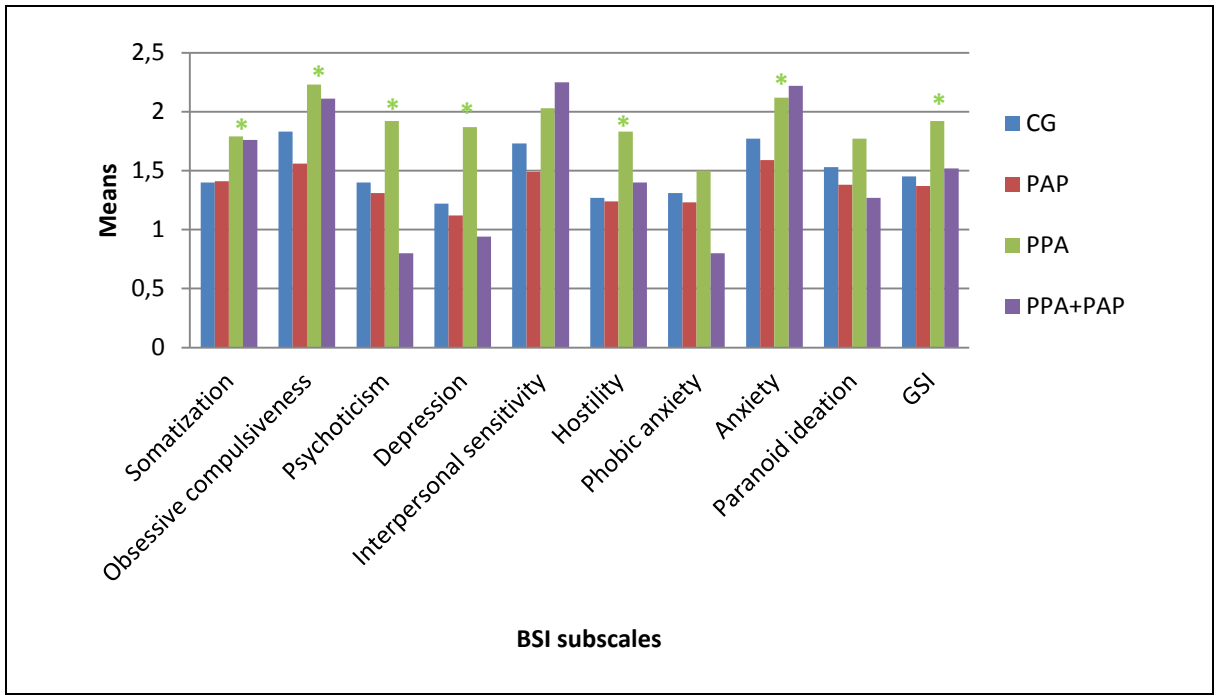

Figure 6: Self-reported psychological distress in a sample of Moroccan adolescent females according to psychosocial variable groups.

CG = Comparison Group
PAP = Adolescents reporting Parental Alcohol use Problems
PPA = Adolescents reporting the experience of Physical and/or Psychological Abuse
PAP+PPA = Adolescents reporting both PAP and PPA
GSI = General Severity Index
* = $p<0.05$, Significant differences with comparison to CG

5.3 Aggressive and antisocial behaviors and negative psychosocial factors in a sample of Moroccan high school students (Paper III)

5.3.1 Aggressive and antisocial behaviors in a sample of Moroccan high school students from an urban area

The study sample (n = 375) had a mean score of 8.64 (SD = 7.49) on the self-reported measure of aggressive antisocial traits (LHA total) (Figure 7). The male high school students (n = 165-169, depending on the subscales) had significantly ($p < 0.001$) higher scores on the LHA total scale, as well as on both the Aggression subscale and the Antisocial Behavior subscale, than did the female students (n = 196-204, depending on the subscales), whereas no significant differences was measured between the genders on the Self-Directed Aggression subscale (Figure 7). On the LHA total scale, 8.6% of the participants (6.1% of the males and 10.7% of the females) scored no points (0). On the subscale level, 9.1% (6.6% of the males and 11.1% of the females) scored no points (0) on the Aggression subscale, 70.5% (71.4% of the males and 69.7% of the females) scored no points (0) on the Self-Directed Aggression subscale, and 74.3% (61.5% of the males and 84.8% of the females) scored no points (0) on the Antisocial Behavior subscale.

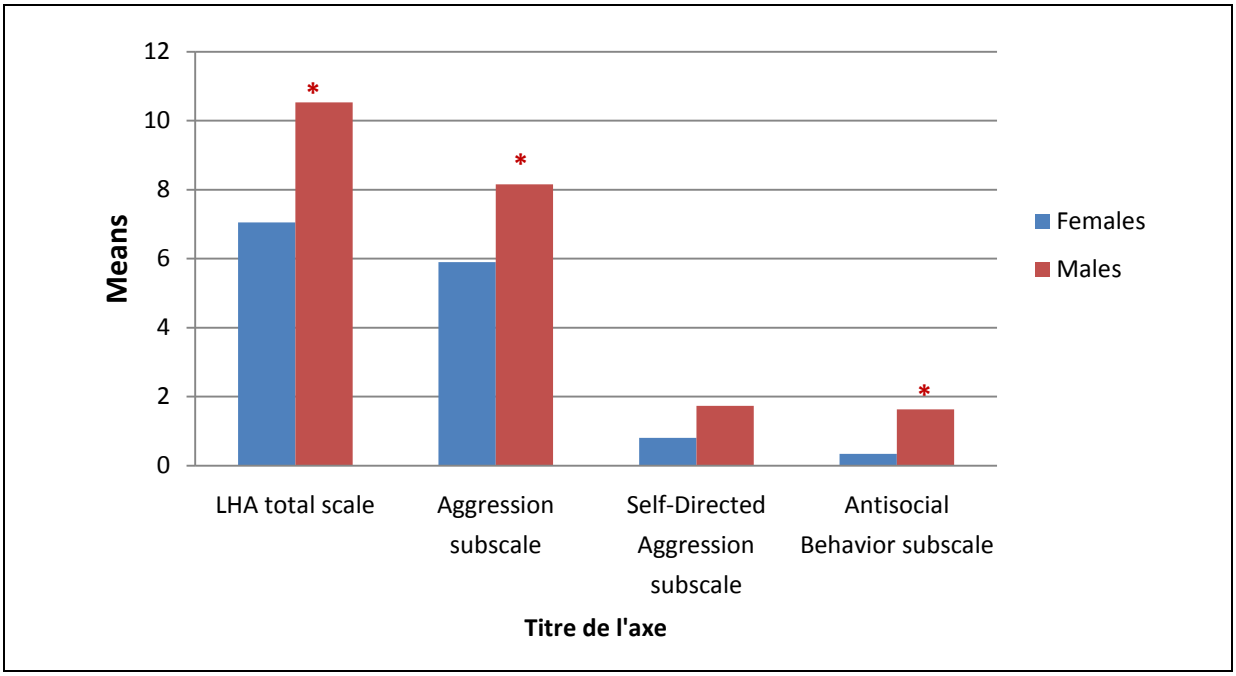

Figure 7: General description of self-reported aggressive antisocial behaviors in a sample of Moroccan adolescents (N=375)
* = p<0.05 Significance level with Mann-Whitney U-test

5.3.2 Self-reported aggressive and antisocial behaviors in high school students reporting alcohol problems of their parents and/or the experience of physical/psychological abuse

The results of the Kruskal-Wallis test showed a significance difference ($p < .001$) between the groups (CG, PAP, PPA and PAP+PPA) in the LHA total scale and the subscale scores (Figure 8). The students from each of the three groups (PAP, PPA and PAP+PPA) scored significantly higher ($p < .001$) on the LHA total scale ($p = 0.001$, $p < 0.001$, $p = 0.001$, respectively), and on the Aggression ($p = 0.01$, $p < 0.001$, $p = 0.002$, respectively) and Antisocial Behavior ($p < 0.001$, $p = 0.001$, $p = 0.01$, respectively) subscales compared to the students from the CG. On the Self-Directed Aggression subscale, the students reporting the experience of abuse (PPA and PAP+PPA groups) had significantly higher scores ($p < 0.001$, $p = 0.02$, respectively) compared to the students in the CG. In addition, the students from the PPA group had significantly ($p = 0.02$) higher scores than did the students in the PAP group.

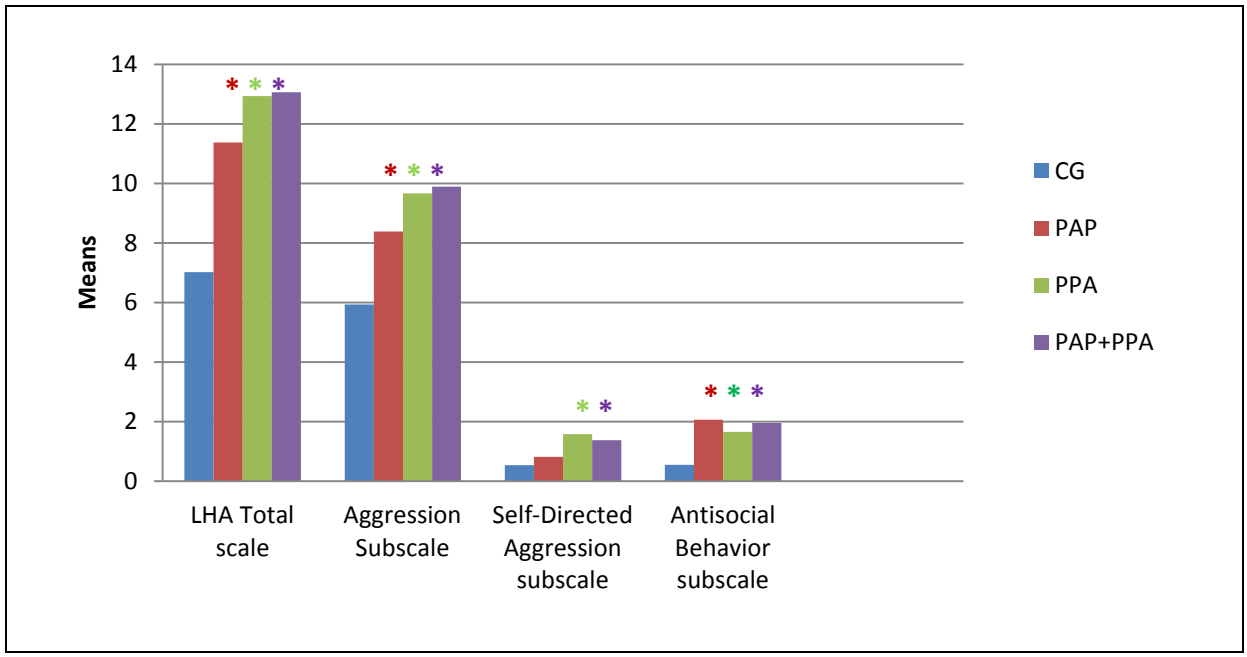

Figure 8: Level of aggressive and antisocial behaviors (measured by LHA and its subscales) according to psychosocial variable groups in a sample of Moroccan high school students

CG = Comparison Group
PAP = Adolescents reporting Parental Alcohol use Problems
PPA = Adolescents reporting the experience of Physical and/or Psychological Abuse
PAP+PPA = Adolescents reporting both PAP and PPA
LHA = Life History of Aggression

* = p<0.05 Significant difference with [a] Kruskal-Wallis test.

6. Discussion

6.1 Somatic and mental health of Moroccan high school students and their level of aggressive and antisocial behaviors

Previous studies, compared cross-culturally, have indicated big differences in the frequency of somatic complaints. Whereas 80% of African-American (Kingery *et al*., 2007) and over 70% of Moroccan **(Paper I)** sampled adolescents report the experience of at least one somatic symptom during the past year, this frequency was 50% in the Croatian (Vulić-Prtorić, 2016) and 'only' 30% in the Swedish adolescent samples (Van Geelen *et al*., 2015).

The somatic complaints included both the existence of physical diagnoses (e.g. diabetes, epilepsy or tuberculosis) and the existence of complaints that are not medically diagnosed (e.g. gastrointestinal complaints or headaches). However, although the physical diagnoses may not be (should not be) culture-sensitive and should be diagnosed according to the same medical criteria in all countries, the prevalence of complaints for digestion problems or pain may be influenced by the culture and should be compared with caution between different cultures (Peacock & Patel, 2008).

In regard to mental health, we find similar trends when comparing results from different countries. A 25-year-old study (Canetti *et al*., 1994) comparing the psychological distress levels of American and Israeli adolescents identified significant differences (the American students reported higher distress levels), but also emphasized the need for culture-specific norm data in adolescent populations. A comparison between the psychopathological distress levels in the American and Israeli samples, and in our sample of Moroccan adolescents, shows that the scores (and therefore the level of psychological distress and mental ill-health) are the highest in Morocco. However, this comparison should be made with great caution, due to the fact that the levels of psychological distress may have changed substantially over time, and that the observed differences most probably cannot be explained solely by cultural effects.

The present thesis also explored gender differences in terms of the adolescents' self-reported somatic and mental health profiles and their levels of aggressive and antisocial behaviors.

The surveyed Moroccan adolescent females reported significantly more somatic complaints, significantly higher levels of psychological distress (in all the BSI subscales,

except hostility), and significantly lower levels of aggressive and antisocial behaviors than did the male adolescents. These findings are generally consistent with previously described gender differences, but also include some small – and for Morocco specific – divergences from previous publications.

Previous research has linked the higher prevalence of somatic complaints in female adolescents to their lower self-esteem and higher levels of perceived stress in the school environment (Låftman *et al*., 2013; Aanesen *et al*., 2017), to sociocultural characteristics associated with greater expression of emotions and concerns by females and, consequently, easier seeking of medical care (Beck, 2007; Chaplin, 2015). It's also linked to biological changes, including pubertal maturity (Hama, 2004; Wiesenfeld-Hallin, 2005), and to physiological and psychological differences manifested in females' excessive attention to well-being and sensitivity in perceiving and reporting symptoms of illness (Sweeting *et al*., 2007). The gender differences in the somatic health profile of Moroccan adolescents mentioned above can also be noticed in their mental health profile. Gender differences in the mental health profiles of adolescents may be explained by gender-specific genetic factors (Kang *et al*., 2011; Qin *et al*., 2016), hormones (Seeman, 1997), brain structure, function, circuitry and pharmacokinetics (Zahn-Waxler *et al*., 2008; Ruigrok *et al*., 2014), and by environmental factors, for instance that males and females may be exposed to different levels of the same environmental risk factors (Biederman *et al*., 2002; Zahn-Waxler *et al*., 2008). It has also been suggested that males are less prone to acknowledge their mental health problems and tend to hide said problems by manifesting externalizing disorders such as substance abuse and antisocial personality (Rice *et al*., 2018; Van Droogenbroeck *et al*., 2018). Females, when hiding their mental health problems, tend to manifest more internalizing disorders such as anxiety and depression (Patel *et al*., 2007; Van Droogenbroeck *et al*., 2018).

Furthermore, this thesis has identified a gender-specific health profile of Moroccan adolescents in the form of gender-specific aggressive and antisocial behaviors. In accordance with previous studies, the Moroccan male high school students in our study population reported significantly higher levels of antisocial and aggressive behaviors than did their female classmates. Various factors are hypothesized to explain both the quantitative and qualitative differences in aggression levels, for instance potential biological, social and evolutionary influences (Archer, 2004), differences in sensitivity and acceptance of aggressive behaviors (Smith *et al*., 2009), associations between testosterone levels and

aggressiveness during adolescence (Yi-Zhen & Jun-Xia, 2009), psychosocial health profiles (Piko *et al*., 2006), and parental differential treatment of males and females (Mandara *et al*., 2012). While this thesis reinforces the general finding that males engage in more frequent and more serious extrovert aggressive acts compared to females, it is important to emphasize that no gender differences could be measured in the frequency of self-harm behaviors in this Moroccan sample. A previous Australian study suggested that self-harm behavior is more frequent in females, which could be associated with the higher level of depression, anxiety, social problems, high-risk of alcohol use, cannabis use, and cigarette smoking in female adolescents (Moran *et al*., 2012). The absence of gender-specific differences in the frequency of self-harm obtained in our study, despite the fact that the Moroccan high school females sample reported higher levels of psychological distress (including anxiety and depression) than did their male classmates, may be related to the collectivist Moroccan culture, which may provide a protective factor against the manifestation of anxiety in the form of self-harm behaviors.

While the prevalence of somatic and mental health problems may differ significantly between studies from different nations, the types of the most common complaints in adolescents are very similar. These complaints concern headaches (Ofovwe & Ofili, 2010; Wöber-Bingöl, 2013; Larsson & Fichtel, 2014), diarrhea and/or constipation problems (Devanarayana *et al*., 2010; Zhou *et al*., 2011), memory problems, concentration difficulties, restlessness, fear, nervousness and feelings of inadequacy during interpersonal interactions (Costello *et al*., 2003; Lima, 2004; Bowker & Raja, 2011), and generally high frequency of deviant behaviors (Van Lier *et al*., 2007; Damron-Bell, 2011). Each of these complaints can be, at least and in part, associated to the school environment and to school-related stress. However, these somatic, mental and behavioral symptoms often appear in adolescents because of the psychobiological multifaceted vulnerability of this development period of human ontogenesis.

Generally, our results strengthen previous models, emphasizing that health is "culturally bounded", where the values, traditions beliefs and experiences within a culture interact with environmental conditions and opportunities, thus influencing the health status of individuals at both group and individual level (Bullinger, 1997).

6.2 Somatic and mental health and the frequency of deviant behaviors in Moroccan high school students reporting negative psychosocial factors in their life

The experience of negative psychosocial factors (such as physical and/or psychological abuse or parental alcohol use problems) is positively associated with the prevalence of somatic (**Paper I)** and mental health (**Paper II)** complaints/problems and with increased levels of aggressive and antisocial behaviors in adolescents (**Paper III**).

This thesis shows that the prevalence of several self-reported somatic complaints (e.g. thyroid disease, gastrointestinal problems, headaches or migraines), the level of psychological distress (specifically higher scores in the somatization, hostility and anxiety dimensions of the BSI), and the level of aggressive (including both extrovert and introvert aggression) and antisocial traits are significantly increased in adolescents reporting the existence of negative psychosocial factors, thus providing further proof that the environment (in this case both the micro- and meso levels) has a major impact on adolescents' health. As the relation between the experience of these negative psychosocial factors and the decreased level of well-being could be measured in the surveyed adolescents' somatic and mental health, and also in their aggressive and antisocial behavior, this thesis points to the importance and need of adequate and holistic support and help from social, health care and educational actors in the life of an adolescent.

The changes, associated with the experience of negative psychosocial factors, in the somatic and mental health profiles of adolescents, may be explained generally with the increased level of chronic stress experienced by the adolescents, which can alter the structure and composition of their central and enteric nervous systems (Million & Larauche, 2016), as well as the chemical composition of their endocrine and immunological systems (Chen *et al*., 2003; Segerstrom & Miller, 2004). The experience of being abused, but also of living with adults who have alcohol use problems, can be regarded as traumatic events and/or conditions in an adolescent's life and can result in changes in both brain structure and function (Ito *et al*., 1993; Kaufman *et al*., 2000; Glaser, 2000; Coates, 2010), which in turn, increase the prevalences of somatic complaints (Halpern *et al*., 2013; Tietjen *et al*., 2017; Tietjen & Faedda, 2017), mental problems (anxiety, depression and obsessive-compulsive personality disorders) (Jeffrey & Jeffrey, 1991; Anda *et al*., 2002; Lafleur *et al*., 2011; Barber *et al*., 2014) and deviant behaviors (Zoroglu *et al*., 2003; Kendra *et al*., 2012; Auslander *et al*., 2016).

7. Limitations

This study had a cross-sectional design; consequently, no conclusions about causal associations (cause-and-effect relationships) should be drawn. The assessed data and the analyses imply several limitations:

1. The assessment method included self-reports. Such reports present well-known limitations. Self-report questionnaires greatly rely on the respondent's capability and willingness to remember and admit the answer. Accordingly, answers may be distorted by social desirability and recall biases.
2. It is known that hormonal changes during the female menstrual cycle have an effect on the frequency of specific somatic complaints (e.g. headaches, migraine or gastrointestinal problems) and even on some dimensions of psychological distress (e.g. depression or interpersonal sensitivity). In the presented analyses there was no possibility to ascertain whether the reported somatic or mental health problem(s) were specifically coupled to the female students' menstrual cycles.
3. The prevalence of medical diagnoses relied on self-reports and were not (could not be) verified against medical records.
4. The assessment of the presence of parental alcohol use problems and/or of the experience of physical and/or psychological abuse did not include any structured measures, archive or register information; consequently, the assessment of abuse did not include the degree or frequency of abuse, any associated disability, or information on the specific type of abuse experienced by the adolescent. Respondents who had a one-time experience of abuse could not be distinguished from respondents who had experienced multiple abuse events.
5. Although the studies included data from almost 700 (**Paper I**) and 400 (**Papers II and III**) high school students, it is a limitation that all the schools were from one city (Tetouan), and that the study population size is only a small fraction of all high school students in this city and, of course, in the whole country (Morocco).

These limitations relating to the data collection strongly restrict the generalizability of the results.

8. Conclusion

The present study provides the first insights into self-reported somatic and mental health profiles, as well as antisocial and aggressive behaviors, in a sample of Moroccan adolescents. This thesis highlights the need for exploratory studies about adolescents' health and well-being internationally, in particular in developing countries.

The majority of the surveyed Moroccan adolescents from four urban high schools reported the existence of one or more somatic complaints (mainly headaches, diarrhea and/or constipation, and allergies) and substantial levels of psychological distress (often related to anxiety). The female students suffered from more somatic complaints and reported higher psychological distress than did their male classmates. The previously reported male proneness towards aggressive and antisocial behaviors, but not towards self-harm behaviors, was confirmed in this Moroccan sample.

This thesis also confirms the positive association between the existence of negative psychosocial factors in the adolescent's environment and the increased probability of somatic (**Paper I**) and mental (**Paper II**) health problems and aggressive and antisocial behaviors (**Paper III**).

Our results strengthen previous findings and emphasize the importance of cooperation between social support and healthcare staff when managing the recovery of adolescents who are living in negative psychosocial environments. The present findings highlight the importance of holistic screening, support and care.

9. Implications and future perspectives

The overall aim of the MeSHe project, within which our research was carried out, is to identify **culture-specific** personality, behavioral, physical or mental symptoms of problematic substance use and of aggressive and antisocial behaviors in adolescents internationally, for early detection and person-centered, optimal support and help. Our study stresses the importance of taking into account future perspectives and needs in which cultural differences in mental and behavioral measures should be acknowledged within health- and social care. In addition, our results point to the importance of a salutogenic perspective in future research, there the aim should be to identify those protective factors which have the capacity to prevent the development of mental complains and deviant behaviors in the adolescents, and instead would be coupled with increased wellbeing.

There are no medical or mental help units in Moroccan schools. Some high schools provide "listening centers" where qualified teachers provide coaching and support to students seeking help. There is a need for these centers to be extended to include multi-professional support, with for instance health- and social caregivers, psychologists and special pedagogues, in every high school in order to be able to identify adolescents who may need help and support at an early stage.

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11. Appendix

UNIVERSITE ABDELMALEK ESSAADI

FACULTE DES SCIENCES

=TETOUAN=

جامعة عبد المالك السعدي

كلية العلوم

=تطوان=

استبيان الصحة الجسدية والعقلية

❖ هذا البحث يهدف إلى:

- دراسة مدى انتشار مختلف المشاكل المرتبطة بالصحة الجسدية و العقلية عند عينة من المتمدرسين المغاربة بالسلك الثانوي التأهيلي.
- تحديد تردد السلوكيات العدوانية و المناهضة للمجتمع عند عينة من المتمدرسين المغاربة بالسلك الثانوي التأهيلي
- تحديد العلاقة بين العوامل النفسية والاجتماعية السلبية و الاضطرابات الجسدية، العقلية والسلوكية .

❖ هذا الاستبيان لا يتضمن أي معلومات تشير إلى هويتك لذلك فمشاركتك في ملأه ليس لها أي تبعات

❖ في حالة قبول المشاركة في هذه الدراسة، المرجو ملء الاستبيان أدناه. أما إذا كنت لا توافق على المشاركة، فيرجى إعادة الاستبيان دون استكماله.

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❖ معلومات عامة

1. الجنس: ذكر ☐ أنثى ☐
2. السن: .....
3. الوزن بـ kg : .....
4. الطول بـ cm : .....
5. المستوى الدراسي و الشعبة : .....
6. هل تزور حاليا الطبيب بانتظام بسبب مواجهتك لمشاكل صحية ؟ نعم ☐ لا ☐
7. هل تتناول حاليا أدوية موصوفة من طرف الطبيب ؟ نعم ☐ لا ☐

7.1. إذا كان الجواب لا، متى كانت آخر مرة أخذت فيها دواء موصوفا من طرف الطبيب ؟ .....

7.2. إذا كان الجواب نعم، ما هو اسم الدواء؟ .....

8. هل سبق لك وعانيت لفترة طويلة من مشكلة مع

8.1. الإسهال، الإمساك ؟ نعم ☐ لا ☐ لا أعرف ☐

8.2. صداع الرأس ؟ نعم ☐ لا ☐ لا أعرف ☐

9. هل سبق تشخيص أي مرض من الأمراض التالية لديك من طرف الطبيب

9.1. السرطان ، اللوكيميا أو غيرها من الأورام؟ نعم ☐ لا ☐ لا أعرف ☐

- إذا كانت الإجابة بنعم، يرجى تحديد:

9.1.1. نوع المرض .....

9.1.2. العمر الذي تم فيه التشخيص .....

9.2. الصرع؟ نعم ☐ لا ☐ لا أعرف ☐

9.2.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.3. أمراض المناعة الذاتية؟ نعم ☐ لا ☐ لا أعرف ☐

9.3.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.4. داء السكري؟ نعم ☐ لا ☐ لا أعرف ☐

9.4.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.5. الربو؟ نعم ☐ لا ☐ لا أعرف ☐

9.5.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.6. حساسية أخرى؟ نعم ☐ لا ☐ لا أعرف ☐

9.6.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.7. الأمراض الجلدية؟ نعم ☐ لا ☐ لا أعرف ☐

9.7.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.8. الاضطرابات الهضمية (حساسية الغلوتين)؟ نعم ☐ لا ☐ لا أعرف ☐

9.8.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.9. مرض الانسداد الرئوي المزمن؟ نعم ☐ لا ☐ لا أعرف ☐

9.9.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.10. السل؟ نعم ☐ لا ☐ لا أعرف ☐

9.10.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.11. الصداع النصفي؟ نعم ☐ لا ☐ لا أعرف ☐

9.11.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.12. أمراض الغدة الدرقية؟ نعم ☐ لا ☐ لا أعرف

9.12.1. إذا كانت الإجابة بنعم، يرجى تحديد العمر الذي تم فيه التشخيص .....

9.13. هل تلقيت في السابق تشخيصا من طرف الطبيب يخص مشاكل نفسية مثل: الاكتئاب، القلق، التوحد، اضطراب التعلم، الخ؟ نعم ☐ لا ☐

9.13.1. إذا كانت الإجابة بنعم، يرجى تحديد المشكل النفسي .....

10. هل لديك إعاقة جسدية تمنعك من النشاط البدني الخاص بك؟ نعم ☐ لا ☐

11. هل تعيش مع والديك معا ؟ نعم ☐ لا ☐

12. هل سبق وأن تعرضت لاعتداء سواء كان جسديا أو نفسيا؟ نعم ☐ لا ☐

13. هل يوجد شخص في عائلتك يشتكي من مشكل الإدمان على الكحول ؟ نعم ☐ لا ☐

14. هل تدخن ؟ نعم ☐ لا ☐ عدد السجائر المتناولة في اليوم.....

15. إذا كنت فتاة :

15.1. ما هو سن أول حيض ؟ .....

15.2. هل تأخذين أي دواء لتحديد النسل؟ نعم ☐ لا ☐

16. الحالة العائلية : عازب(ة) ☐ متزوج(ة) ☐ حالة أخرى ☐

❖ السلوك العدواني LHA

المرجو قراءة الأسئلة التالية والإشارة إلى عدد المرات التي وقعت فيها لك الأحداث المشار إليها مستعينا بالتعليمات أسفله. المرجو عدم إدماج التخيلات أو الأفكار التي لم تؤدي إلى العمل الفعلي والاكتفاء باحتساب المواقف التي شاركت فيها بشكل لفظي أو جسدي. من المهم دمج جميع المواقف التي يمكن تذكرها منذ 13سنة من عمرك

0 : **بدون حوادث** 1: **حدث واحد** 2 : **حدثان أو ثلاثة أحداث**

3 : من **أربعة إلى تسعة أحداث** 4 : **أكثر من عشرة أحداث** **5 : أكثر مما أستطيع أن أحصي**

كم مرة في حياتك عايشت الأحداث التالية ؟	
1. تنتابك نوبة من الغضب الشديد عند إغاظتك (كالصراخ، غلق الأبواب بقوة، رمي الأشياء...)، مع إمكانية الانهيار.	
2. سبق أن شاركت في معارك مع أشخاص آخرين	
3. سبق وأن شاركت في النزاعات اللفظية، المشاجرات أو الصياح على الناس الآخرين	
4. الاعتداء عمدا على شخص أو حيوان	
5. ضرب أو تكسير الأشياء (كالنافذة أو المحمول) عمدا وبغضب	
6. محاولة التسبب بالأذى الجسدي لنفسك في حالة الغضب و الاستياء	
7. محاولة الانتحار في حالة الغضب و الاستياء	
8. كانت لديك مشاكل تخص السلوك في المدرسة أدت إلى توبيخك أو إيقافك	
9. كانت لديك مشاكل مع المدرسين أو المدراء بسبب العدوانية / السلوك المتهور الشيء الذي أذى إلى تحذيرات، استبعاد أو إيقاف	
10. واجهت صعوبات أو دخلت في نزاعات مع أشخاص آخرين بسبب الكذب، السرقة، الديون، بيع المخدرات، الدعارة، حريق متعمد، القيادة في حالة سكر إلى غير ذلك من الأسباب	
11. كانت لديك مشاكل مع القانون أو الشرطة مما أدى إلى تحذيرات أو تقارير أو اعتقال أو إدانة بجرائم بسيطة أو خطيرة	

❖ (BSI) 53

أمامك قائمة مشاكل أو شكاوي يعاني منها بعض الناس . اقرأ كل واحدة بتمعن وضع دائرة حول الرقم الذي يبين إلى أي مدى عانيت من هذه المشكلة المرجو شمل جميع المواقف التي عانيت منها. الرجاء عدم ترك أي جملة.

12. إلى أي مدي عانيت من :	مطلقا	نادرا	أحيانا	غالبا	دائما
12.1. العصبية	0	1	2	3	4
12.2. الشعور بالعياء أو الإغماء أو الدوخة والإرهاق الشديد مثلاً	0	1	2	3	4
12.3. الاعتقاد بأن شخصاً ما يستطيع السيطرة على أفكارك	0	1	2	3	4
12.4. إلقاء اللوم على الآخرين في معظم متاعبك	0	1	2	3	4
12.5. صعوبة في تذكر الأشياء	0	1	2	3	4
12.6. الشعور بسرعة الضيق والإثارة	0	1	2	3	4
12.7. الإحساس بألم في القلب أو الصدر	0	1	2	3	4
12.8. الشعور بالخوف في الأماكن المفتوحة أو الشوارع	0	1	2	3	4
12.9. التفكير في إنهاء حياتك	0	1	2	3	4
12.10. الشعور بعدم الثقة في معظم الناس	0	1	2	3	4
12.11. ضعف الشهية للطعام	0	1	2	3	4
12.12. الخوف أو الرعب المفاجئ بدون سبب	0	1	2	3	4
12.13. نوبات من الغضب لا تستطيع السيطرة عليها	0	1	2	3	4
12.14. الشعور بالوحدة عندما تكون مع مجموعة أشخاص	0	1	2	3	4
12.15. عدم القدرة على إتمام أعمالك	0	1	2	3	4
12.16. الشعور بالوحدة والعزلة	0	1	2	3	4
12.17. الشعور بالحزن و الانقباض	0	1	2	3	4
12.18. الشعور بعدم الاهتمام بما حولك	0	1	2	3	4
12.19. الشعور بالخوف	0	1	2	3	4
12.20. الإحساس بأن مشاعرك يمكن أن تجرح بسهولة	0	1	2	3	4

12.21. الشعور بعدم صداقة الناس لك أو أنهم لا يحبونك	0	1	2	3	4
12.22. الشعور بأنك أقل من الآخرين (الشعور بالنقص)	0	1	2	3	4
12.23. غثيان أو مغص في المعدة (البطن)	0	1	2	3	4
12.24. الشعور بأن الآخرين يراقبونك أو يتحدثون عنك	0	1	2	3	4
12.25. صعوبة النوم بعمق	0	1	2	3	4
12.26. الحاجة إلى التحقق ثم التأكد مجددا مما تفعله	0	1	2	3	4
12.27. الشعور بصعوبة في اتخاذ القرارات	0	1	2	3	4
12.28. الخوف من الركوب في الباص أو المواصلات العامة	0	1	2	3	4
12.29. الشعور بصعوبة في التنفس	0	1	2	3	4
12.30. الإحساس بنوبات من السخونة والبرودة في جسمك	0	1	2	3	4
12.31. الاضطرار إلى تجنب أشياء أو أفعال أو أماكن معينة لأنها تسبب لك الإحساس بالخوف	0	1	2	3	4
12.32. الشعور بأن ذهنك خالي من الأفكار	0	1	2	3	4
12.33. تنميل أو تخذير في أجزاء من جسمك	0	1	2	3	4
12.34. الشعور بالذنب وأنك تستحق العقاب على خطئك	0	1	2	3	4
12.35. الشعور بفقدان الأمل في المستقبل	0	1	2	3	4
12.36. صعوبة التركيز	0	1	2	3	4
12.37. الشعور بالضعف في جميع أنحاء جسدك(انك مرهق)	0	1	2	3	4
12.38. الشعور بالتوتر أو بالحماس	0	1	2	3	4
12.39. التفكير بالموت (الخوف من الموت)	0	1	2	3	4
12.40. الإحساس بدافع ملح لأن تضرب أو تجرح أو تؤذي شخصاً معيناً	0	1	2	3	4
12.41. الاندفاع لتخريب وتكسير الأشياء	0	1	2	3	4
12.42. الإحساس بالخجل والهيبة في وجود الآخرين	0	1	2	3	4
12.43. الشعور بعدم الارتياح مع الحشود	0	1	2	3	4

12.44. الشعور بالوحدة والاغتراب حتى في وجود الآخرين	0	1	2	3	4
12.45. نوبات من الخوف و الفزع بدون سبب	0	1	2	3	4
12.46. الدخول في كثير من الجدل والمناقشات	0	1	2	3	4
12.47. الشعور بالتوتر عندما تترك وحيداً	0	1	2	3	4
12.48. الشعور بأن الآخرين لا يعطونك ما تستحق من ثناء وتقدير على أعمالك وانجازاتك	0	1	2	3	4
12.49. الشعور بعدم الاستقرار لدرجة لا تمكنك من الجلوس هادئاً في مكان (تكثر حركتك)	0	1	2	3	4
12.50. الشعور بأنك عديم الأهمية	0	1	2	3	4
12.51. الشعور بأن الناس يستغلونك	0	1	2	3	4
12.52. الشعور بالذنب لأتفه الأسباب	0	1	2	3	4
12.53. فكرت أنه هناك شيئا خطأ في ذهنك	0	1	2	3	4

* شكرا على مشاركتكم *

Original Article

SAGE Open Medicine

SAGE Open Medicine
Volume 7: 1–11

DOI: 10.1177/2050312119852527
journals.sagepub.com/home/smo
SAGE

Somatic health and its association with negative psychosocial factors in a sample of Moroccan adolescents

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Abstract

Background: Adolescence is a distinct developmental phase characterized by multiple physical and psychological changes and by an increased vulnerability to somatic and mental health problems. These risk and vulnerability factors are part of a complex biopsychosocial matrix, encompassing multiple factors, such as inherited biological determinants and psychological, societal, and cultural influences, which affect an adolescent's overall wellbeing. In Morocco, similar to other developing countries, adolescents (young people aged from 15 to 19 years) constitute a substantial proportion of the population (almost 9%). However, studies about adolescents' health in developing countries are scarce. In this study, we describe adolescents' somatic health in a sample of high school students from the city of Tetouan, Morocco, and investigate how negative psychosocial factors, such as parental alcohol use problems and/or the experience of abuse, may influence them.

Methods: The study sample included 655 adolescents (315 boys and 340 girls, $M = 16.64$ years, range = 15–18 years) from conviniently selected classes of four high schools in the city of Tetouan in Morocco. The students responded to a survey that assessed the prevalence of somatic complaints/disorders. They also indicated whether they had ever experienced physical and/or psychological abuse and whether they had parents with alcohol use problems.

Results: More than half of the adolescents suffered from headaches and one-third had substantial problems with diarrhea or constipation. Both problems were more common in female students. The third most frequent somatic problem, affecting one in four in both genders, was allergy. Almost one-third of Moroccan adolescents (significantly more boys than girls; $p = 0.004$) reported no somatic complaints. In adolescents who reported parental alcohol use problems and/or experience of physical and/or psychological abuse, the prevalence of several somatic complaints (epilepsy, migraine, headache, diarrhea/constipation, gluten intolerance, allergy, and skin or thyroid disease) increased highly significantly compared to the adolescents who reported no such psychosocial environmental factors.

Conclusion: The results suggest that only 3 in 10 urban-living Moroccan adolescents are free of somatic complaints, while the majority suffer from some somatic problems, most often headaches and diarrhea/constipation. The association of certain negative psychosocial factors with adolescents' somatic health suggests the need of a holistic approach to the treatment of affected adolescents.

Keywords

adolescents, Morocco, parental alcohol use problems, physical or psychological abuse, somatic health

Date received: 21 June 2018; accepted: 30 April 2019

Introduction

Despite being a developing country with relatively limited understanding of the importance of improving the health and wellbeing of young people,[1] Morocco has, over the past decade, developed several health strategies pertaining to healthcare and equal access to care for all citizens.[2] In Morocco, similar to other developing countries,[3] adolescents (young people aged from 15 to 19 years) constitute a substantial proportion

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of the population (8.9% in Morocco in 2014).[4] The promotion of adolescents' health is a priority matter at both national and international levels. In Morocco, the Ministry of Health and the Ministry of Education work closely together to improve the psychosocial development of Moroccan adolescents.[5] Nevertheless, there are few scientific studies that explore the actual health profile of Moroccan adolescents. This study aims at providing a general picture of the somatic health of a sample of high school students living in a city in northern Morocco.

The brain has an adaptive function through which it adjusts to environmental demands. This adaptive function accelerates during adolescence.[6] The environmental demands can vary considerably across individual environments and cultures.[7] The demands and the related risks are parts of a complex biopsychosocial matrix, encompassing multiple factors, such as inherited biological determinants and psychological, societal, and cultural influences, which affect an adolescent's behavior, somatic and mental health, and overall wellbeing.

During adolescence, the brain undergoes significant development and re-wiring. Frequently used synapses become stronger, whereas less used ones are progressively eliminated. The cerebral cortex becomes thinner and more efficient during this period in life.[8] The environment and experiences to which adolescents are exposed play an important role in determining which synapses are eliminated and which ones are strengthened.[9] It has been shown that traumatic childhood events are linked to specific changes in certain brain areas.[10–12] For example, children and adolescents with posttraumatic stress disorder have been found to manifest significant volume reductions of their temporal lobe, prefrontal cortex, and areas of the corpus callosum and its subregions.[13] The alterations of these brain regions can extend to other functionally connected areas, especially the limbic areas, and potentially cause dysregulation of cognitive, emotional, behavioral and biological functions, which may manifest itself in the form of insecure attachment[14] and mental and somatic health problems.[15–18]

Previous studies have shown that traumatic, stressful life events, such as growing up in a family with alcoholic parents and/or experiencing physical and/or psychological abuse (PPA), increases the probability of somatization, in particular as regards the frequency of gastrointestinal problems, migraine, headaches,[19,20] thyroid dysfunction,[21] chronic lung-, liver-, and vascular diseases, and even cancer.[19]

In this study, we aim to (1) investigate the frequency of defined somatic symptoms/disorders in a sample of urban Moroccan adolescents and (2) define the prevalence of somatic complaints in adolescents who report parental alcohol use problems and/or the experience of PPA.

Methods

Study population

Data collection was carried out within the framework of the "Mental and Somatic Health without borders (MeSHe)" project, which is an international project identifying culture-specific aspects of mental and somatic health in adolescents for early identification of substance abuse and aggressive, antisocial behaviors.[22]

The population of this study included students ($N=655$; 315 boys and 340 girls) from the 10th ($n=250$), 11th ($n=287$), and 12th ($n=118$) grades of four high schools in the city of Tetouan. Tetouan is located in the far north of the African-Arabic country of Morocco, about 20 km from the Strait of Gibraltar. During the 2013/2014 academic year, data were collected from one high school, comprising a total of 50 10th, 11th, and 12th grade classes. Four classes from each grade were selected to participate in the study. In these 12 classes, there were 456 students, of which 280 (61%) completed the survey. During the 2014/2015 academic year, data collection continued and three additional high schools were included in the study. These high schools comprised a total of 97 10th, 11th, and 12th grade classes. Two classes from each grade and from each school were selected by convenience to participate in the study. In these 24 classes, there were 876 students, of which 375 (43%) completed the survey.

The students received oral and written information about the study (background, aim, and content). Those students who agreed to participate completed the survey individually in a classroom without any outside disturbance. Only a research assistant remained in the room to answer any questions.

The overall study sample represents 4.2% of the total high school student population in the city of Tetouan ($N=15{,}506$ students in 17 high schools). The age range in the study population was 15–18 years, and the mean age was 16.64 ($SD=1.0$) years.

Measures and study design

The overall aim of the "Mental and Somatic Health without borders" (MeSHe) study (www.meshe.se) is to identify culture-specific risk and protective factors pertaining to adolescent health. Data are collected by means of the MeSHe survey, which comprises several validated measures and a background questionnaire that assesses basic sociodemographic data, self-declared somatic health complaints, and the presence of specific negative psychosocial factors in the respondent's life. The validated measures included in the MeSHe survey are the following ones: (1) the Life History of Aggression Inventory, which measures the occurrence of aggressive and antisocial behaviors; (2) the Brief Symptom Inventory, which measures the degree of psychological distress; (3) the Alcohol Use Disorder Identification Test is used to assess alcohol consumption, drinking behaviors, and alcohol-related problems; (4) the Drug Use Disorder Identification Test assesses an individual's illicit drug use and related consequences; (5) the Positive Affect and Negative Affect Schedule Expanded Form 30 items questionnaire measures two general affective states distributed over four dimensions:

Table 1. Test–retest reliability of the MeSHe background questionnaire assessed in a class of high school students ($N=31$) with a 2-week interval.

	Time 1 (yes/no)[a] %	Time 2 (yes/no)[a] %	Chi-square test		
			χ^2	*p*-value	Cramer's *V*
Headaches	(14/13) 51.8	(10/20) 33.3	0.65	0.34	0.16
Diarrhea/ constipation	(5/24) 17.2	(5/23) 17.8	1.13	0.40	0.21
Allergy	(5/25) 16.7	(4/25) 13.8	0.56	0.60	0.14
Skin disease	(8/23) 25.8	(5/26) 16.1	0.63	0.38	0.14
Migraine	(3/28) 9.7	(2/29) 6.4	0.23	0.81	0.09
Asthma	(2/29) 6.4	(2/29) 6.4	0.15	0.88	0.07
Epilepsy	(1/30) 3.2	(1/29) 3.3	0.04	0.97	0.03
Gluten intolerance	(1/29) 3.3	(0/29) 0	No statistics computed		
Diabetes	(0/29) 0	(0/29) 0	No statistics computed		
Cancer	(0/31) 0	(0/31) 0	No statistics computed		
Tuberculosis	(0/31) 0	(0/31) 0	No statistics computed		
Thyroid disease	(0/31) 0	(0/31) 0	No statistics computed		

MeSHe: Mental and Somatic Health without borders.
[a]*n* includes those answering yes or no to the question.

positive (activated and deactivated) and negative (activated and deactivated) affect; (6) the Godin Leisure-Time Exercise Questionnaire, which measures frequency and intensity of leisure-time physical activity; and (7) the Temperament and Character Inventory (TCI) capturing individual differences in personality traits.

The questionnaire about self-reported somatic complaints was developed by the project leader (N.K.) based on a similar questionnaire used in the Child and Adolescent Twin Study in Sweden.[23] The test–retest reliability of the questionnaire was tested in this study, showing no significant differences in the reports of any of the items (*p*-values between 0.34 and 0.97; Table 1).

Two items of the questionnaire assess the presence of negative psychosocial factors: "Have you ever been physically and/or psychologically abused?" and "Do you have a parent who has problems with alcohol?"

Ethical considerations

The survey was designed and used in accordance with the Declaration of Helsinki.[24] Participation was voluntary, and data were collected on anonymous survey sheets ensuring that the answers provided would in no way affect the respondent's academic evaluation. All participants received a written and an oral presentation of the MeSHe project and its aims and were given the opportunity to ask questions about the project and discuss their participation with a researcher.

Completion of the survey was considered as consent to participate. The survey was approved with the registration number 85, by the Regional Directorate of the Ministry of National Education in Tetouan, responsible for managing and directing all matters concerning students from primary to high school education at Tetouan province. The use of the survey also was approved by the Faculty of Science, University Abdelmalek Essaadi, by the concerned high schools' directors and by the high schools' parent associations.

Statistical analysis

The sample characteristics were defined by descriptive statistics using the Statistical Package for the Social Sciences (SPSS) 21.0 (IBM) software tool. The chi-square test was applied to test the association between group membership and the defined somatic symptoms and diseases. Significance was set at $p<0.05$. The strength of the statistically significant relationship was evaluated using Cramer's *V* effect size with the following measure of association: values from 0.07 to 0.21 indicate a small effect, values from 0.21 to 0.35 indicate a medium effect, and values greater than 0.35 indicate a large effect.[25]

Subsequently, contingency square analysis was performed to assess the relationship within groups. The adjusted *Z* scores were calculated and transformed to chi-square by multiplying them with each other. Corrections for type I errors were made using the Bonferroni correction,[26,27] setting the significance cut-off at α/n $(0.05/3=0.017)$, where n refers to the number of compared groups.

To determine the test–retest reliability for the background questionnaire, one class was selected. The students in this class ($N=31$; 8 boys and 23 girls; $M=17.10$ years; $SD=0.47$) completed the questionnaire twice with a 2-week interval. Chi-square analysis was performed to compare any differences in the prevalence of each somatic complaint.

Results

Prevalence of somatic health problems in a sample of urban Moroccan high school students

The detailed prevalence of defined somatic symptoms and diseases is presented in Table 2. The most prevalent somatic problem was headaches, which was reported by 57.5% of the total sample (62.8% in girls, 51.8% in boys), followed by problems with diarrhea or constipation, reported by 30.3% (37.8% in girls, 22.6% in boys), and allergy reported by 24.6% (29.6% in girls, 19.3% in boys).

In general, girls reported headaches, allergy, and diarrhea/constipation significantly more often than boys ($p=0.002$,

Table 2. Prevalence of defined somatic symptoms and diseases in a sample of Moroccan adolescents ($N = 655$).

	Total sample (yes/no)[a] %	Boys (yes/no)[a] %	Girls (yes/no)[a] %	Chi-square test		
				χ^2	*p*-value	Cramer's *V*
Headaches	(335/248) 57.5	(146/136) 51.8	(189/112) 62.8	12.6	0.002	0.14
Diarrhea/ constipation	(166/382) 30.3	(61/209) 22.6	(105/173) 37.8	15.12	0.001	0.15
Allergy	(138/423) 24.6	(53/221) 19.3	(85/202) 29.6	7.67	0.020	0.11
Skin disease	(107/492) 17.9	(47/246) 16	(60/246) 19.6	1.52	0.46	0.05
Migraine	(85/503) 14.5	(44/243) 15.3	(41/260) 13.6	2.4	0.30	0.06
Gluten intolerance	(41/547) 7	(15/272) 5.2	(26/375) 6.5	5.12	0.08	0.09
Asthma	(33/557) 5.6	(12/278) 4.1	(21/279) 7	2.36	0.31	0.06
Thyroid disease	(26/580) 4.3	(7/287) 2.4	(19/293) 6.1	5.09	0.08	0.09
Epilepsy	(18/570) 3.2	(11/271) 3.9	(7/299) 2.3	4.36	0.11	0.08
Diabetes	(11/580) 1.9	(6/283) 2.1	(5/297) 1.7	0.34	0.84	0.02
Cancer	(8/609) 1.3	(5/302) 1.6	(3/307) 1	1.46	0.48	0.05
Tuberculosis	(7/602) 1.1	(2/295) 0.7	(5/307) 1.6	3.76	0.15	0.08
None of the above	(187/449) 29.4	108/203 34.7	79/246 24.3	8.31	0.004	0.11

[a]*n* includes those answering yes or no to the question.

0.02, 0.001, respectively). The prevalence of epilepsy, diabetes, and cancer was low (3.2%, 1.9%, 1.3%, respectively), and 1% of the students reported a diagnosis of tuberculosis (two boys and five girls). Significantly, more boys (34.7%) than girls (24.3%) reported having none of the defined somatic symptoms or diseases.

Somatic complaints in adolescents reporting parental alcohol problems or experience of being abused

Of the 655 students participating in this study, 42 (6.4%) did not answer one or both of the following questions: "Have you ever been physically and/or psychologically abused?" and "Do you have a parent who has problems with alcohol?" Of the remaining 613 students, 44 (7.2%, 12 girls and 32 boys) answered "Yes" to both questions.

To determine the association of each negative psychosocial factor with somatic health separately, the answers of the remaining 569 students were classified into three groups: adolescents not reporting having parents with alcohol problems (PAP) nor the experience of being abused (comparison group (CG); $n=407$), adolescents reporting having PAP ($n=61$, 10%); and adolescents reporting the experience of PPA ($n=101$, 16.5%). There were 44 students reporting having both PAP and the experience of PPA. We decided not to create a PAP + PPA group of these students, because in addition to its low prevalence (6.7%), no significant divergency in the prevalence of any somatic complain was found in this group.

The comparison of the frequencies of somatic complaints between the three groups (CG, PAP, and PPA) revealed significant interaction (Table 3). The prevalence of allergy ($\chi^2(2, n=605)=7.17$, $p=0.03$), diarrhea/constipation ($\chi^2(2, n=611)=9.28$, $p=0.02$), skin disease ($\chi^2(2, n=606)=8.48$, $p=0.01$), epilepsy ($\chi^2(2, n=602)=12.83$, $p=0.002$), migraine ($\chi^2(2, n=607)=54.16$, $p<0.001$), headaches ($\chi^2(2, n=607)=23.72$, $p<0.001$), gluten intolerance ($\chi^2(2, n=605)=32.3$, $p<0.001$), or thyroid disease ($\chi^2(2, n=606)=33.74$, $p<0.001$) differed significantly between the groups, each differing with a small to moderate effect size (Cramer's *V* between 0.13 and 0.32; Table 3).

Post hoc comparisons revealed that adolescents belonging to the CG reported significantly fewer problems with gluten intolerance ($\chi^2(2, n=605)=13.22$, $p=0.001$), migraine ($\chi^2(2, n=607)=38.07$, $p<0.001$), headaches ($\chi^2(2,$

Table 3. Prevalence and risk ratio (RR) of defined somatic symptoms and diseases according to psychosocial variable groups.

	CG ($n=407$)	PAP ($n=61$)		PPA ($n=101$)		Chi-square test		
	%	%	RR	%	RR	χ^2	*p*-value	Cramer's *V*
Headaches	49.20	67.80	1.38	75.30	1.53	23.72	<0.001	0.21
Diarrhea/constipation	24.50	30.20	1.23	39.80	1.56	8.00	0.020	0.13
Allergy	24.50	15.30	0.62	34.50	1.41	7.17	0.030	0.12
Skin disease	16.10	12.10	0.75	28.60	1.78	9.28	0.010	0.13
Migraine	6.80	12.30	1.81	34.70	5.10	54.16	<0.001	0.32
Gluten intolerance	4.30	1.70	0.39	20.00	4.65	32.30	<0.001	0.25
Asthma	4.70	7.10	1.51	8.70	1.85	2.53	0.28	0.07
Thyroid disease	1.80	1.70	0.94	14.60	8.11	33.74	<0.001	0.25
Epilepsy	1.60	1.80	1.12	8.30	5.19	12.83	<0.001	0.16
Diabetes	1.10	1.80	1.64	3.10	2.82	2.23	0.33	0.06
Cancer	1.00	0.00	0.00	3.10	1.78	3.49	0.17	0.08
Tuberculosis	1.80	0.00	0.00	0.00	0.00	2.80	0.25	0.07

CG: comparison group; PAP: adolescents reporting parental alcohol use problems; PPA: adolescents reporting the experience of physical and/or psychological abuse.

$n=607)=22.94$, $p<0.001$), or thyroid disease ($\chi^2(2, n=606)=17.98$, $p<0.001$) than the adolescents belonging to the PAP or PPA groups.

The adolescents reporting the experience of PPA were significantly more likely to have epilepsy ($\chi^2(2, n=602)=12.82$, $p=0.002$), migraine ($\chi^2(2, n=607)=53.29$, $p<0.001$), headaches ($\chi^2(2, n=607)=16.56$, $p<0.001$), gluten intolerance ($\chi^2(2, n=605)=31.81$, $p<0.001$), skin disease ($\chi^2(2, n=606)=2.95$, $p=0.01$), or thyroid disease ($\chi^2(2, n=606)=33.76$, $p<0.01$) than the adolescents reporting parental alcohol use problems or reporting none of the psychosocial problems considered (Table 4).

In those who reported the experience of PPA, the risk of having somatic complaints increased significantly for several of the defined complaints. The risk of having thyroid disease was eight times higher for the PPA group (risk ratio (RR)=8.11), while the risk of having complaints for migraine, epilepsy, or gluten intolerance increased about five times in these students (RR=5.19, 5.1, and 4.65, respectively). The risk that these adolescents (PPA) also have diabetes almost tripled (RR=2.82), and their risk of having asthma almost doubled (RR=1.85). The risk of having any of these somatic complaints did not increase significantly in the adolescents who reported parental alcohol use problems (PAP group), with the exception of the risk of headaches, which increased about 50% (RR=1.53; Table 3).

Discussion

To the best of our knowledge, the present work is the first explorative study focusing on a sample of Moroccan adolescents. Only about a third of the 15- to 18-year-old high school students reported no somatic complaints at all; consequently, the vast majority (over 70%) of the students from this urban area in Morocco suffered from some kind of somatic condition. Our finding is in line with some previous results showing that 83% of African-American adolescents reported at least one somatic symptom in 2007.[28] However, studies in Swedish and Croatian adolescent populations have reported relatively low prevalences (30%–50%) of somatic symptoms.[29,30] While the physical diagnoses may not be culture sensitive (epilepsy, diabetes, and tuberculosis, for instance, should be diagnosed according to the same medical criteria in all countries), the prevalence of complaints for digestion problems or pain (such as headaches) may be influenced by the culture and should be compared with caution between different countries.[31] However, the finding that almost 1% of Moroccan adolescents living in an urban area still suffer from tuberculosis should be noted and discussed in the light of lacking medical resources for monitoring and control of this disease in Morocco.[32]

Although the prevalence of somatic problems may differ significantly between studies from different countries, the type of the most common somatic complaints in adolescents is very similar. This study showed that headache was the most prevalent somatic problem reported by over half of the Moroccan adolescent sample, in line with earlier surveys conducted in different countries.[33–35] The presence of headaches in adolescents has previously been associated with psychiatric illness and psychosocial problems,[36–38] and with the presence of other somatic complaints.[39]

Importantly, the sample consisted of high school students. Although the school environment promotes the development of the adolescent, it also places constraints and demands on them that may entail stress.[40] A series of studies have implicated stress in the development and maintenance of health complaints,[41–43] especially headaches,[44,45] gastrointestinal disorders,[46,47] and allergy.[48,49] Consequently, the most prevalent somatic problems reported by the adolescent students in this study, namely headaches, diarrhea and/or constipation

Table 4. Post hoc analyses for prevalence of defined somatic symptoms and diseases according to psychosocial variable groups.

		CG ($n=407$)	PAP ($n=61$)	PPA ($n=101$)
Headaches	Adjusted *Z* scores	−4.79	1.98	4.07
	χ^2	22.94	3.92	16.56
	p-value	<0.001	0.14	<0.001
Diarrhea/ constipation	Adjusted *Z* scores	−2.55	0.43	2.69
	χ^2	6.50	0.18	7.24
	p-value	0.04	0.91	0.03
Allergy	Adjusted *Z* scores	−0.52	−1.86	2.21
	χ^2	0.27	3.46	4.88
	p-value	0.87	0.18	0.09
Skin disease	Adjusted *Z* scores	−1.64	−1.21	2.95
	χ^2	2.69	1.46	8.70
	p-value	0.26	0.48	0.013
Migraine	Adjusted *Z* scores	−6.17	−0.02	7.30
	χ^2	38.07	0.0004	53.29
	p-value	<0.001	1.00	<0.001
Gluten intolerance	Adjusted *Z* scores	−3.65	−1.63	5.64
	χ^2	13.22	2.66	31.81
	p-value	0.001	0.26	<0.001
Asthma	Adjusted *Z* scores	−1.54	0.52	1.40
	χ^2	2.37	0.27	1.96
	p-value	0.31	0.87	0.37
Thyroid disease	Adjusted *Z* scores	−4.24	−0.96	5.81
	χ^2	17.98	0.92	33.76
	p-value	<0.001	0.63	<0.001
Epilepsy	Adjusted *Z* scores	−2.69	−0.52	3.58
	χ^2	7.24	0.27	12.82
	p-value	0.03	0.87	0.002
Diabetes	Adjusted *Z* scores	−1.34	0.18	1.43
	χ^2	1.79	0.03	2.04
	p-value	0.40	0.98	0.36
Cancer	Adjusted *Z* scores	−0.82	−0.94	1.75
	χ^2	0.67	0.88	3.06
	p-value	0.71	0.64	0.21
Tuberculosis	Adjusted *Z* scores	1.67	−0.92	−1.23
	χ^2	2.79	0.85	1.51
	p-value	0.25	0.65	0.47

CG: comparison group; PAP: adolescents reporting parental alcohol use problems; PPA: adolescents reporting the experience of physical and/or psychological abuse.
Significance level set at $p < 0.017$ after Bonferroni adjustment.

problems, and allergy, in that order of importance, may be at least, in part, associated to the school environment and more specifically to school-related stress.

We found that adolescent females from an urban area of Morocco report more somatic complaints compared to their male classmates, which is in line with other international studies on adolescent health.[29,50] In two Scandinavian studies, lower self-esteem and higher levels of perceived stress in the school environment could partially explain the increased prevalence of health complaints reported by girls.[51,52] As suggested by one of the Nordic studies, boys seem to be more casual about the demands placed on them by their school and be more relaxed about ideal body standards, whereas girls seem to be under the double pressure to conform to the ideal body image and to perform well at school.[52]

The observed gender differences may be related to biological changes, including pubertal maturity,[53,54] physiological, and psychological differences, such as females being more attentive to their wellbeing and more sensitive in perceiving and reporting symptoms of illness,[55] and to sociocultural characteristics associated with greater expression of emotions and concerns by females and, consequently, easier seeking of medical care.[56,57]

Negative psychosocial environmental factors and adolescent somatic health

Our study suggests that the experience of physical and/or psychological abuse (PPA) has a dramatic effect on the somatic health of adolescents. The prevalence of thyroid disease was significantly increased in the group of adolescents who reported the experience of PPA. This result may also be associated with the chronic stress caused by the experience of abuse. Indeed, thyroid function is usually down-regulated during such stressful conditions.[21] Stressful life events may cause alteration in serum thyroid hormone levels and initiate the synthesis of anti-thyroid antibodies, causing autoimmune thyroiditis.[58–60]

Another significantly increased somatic complaint in adolescents reporting this negative psychosocial factor in their life was skin problems. Earlier research indicates that skin problems are often comorbid with psychiatric disorders (anxiety, depression, and obsessive–compulsive personality disorders).[61,62] In addition, PPA constitute stressful life events that may play an important role in triggering or aggravating skin problems and disorders.[62–64]

Adolescents belonging to the PPA group had a substantially increased risk of having neurological complaints (like migraine and epilepsy) and gastrointestinal complaints (diarrhea/constipation and gluten intolerance).

As regards neurological complaints, this study showed a strong and significant increase in the prevalence of epilepsy in adolescents with experience of PPA compared to those not reporting having parents with alcohol use problems or the experience of being abused. Similar results have been found by various studies explaining the negative effect of sexual abuse on brain development, resulting in changes in both brain structure and function.[12,14,65–67] This increase of epilepsy prevalence among adolescents who reported the experience of PPA may also be explained by the fact that negative life events, such as PPA, may increase the probability of having a greater response to stressors, which in turn increases the probability of inducing epileptic activity.[68]

The risk of having migraine and headaches in students who reported experience of PPA was also significantly increased compared to their classmates without such experiences. This finding is in accordance with a recently published retrospective study, which found that young adults having experienced any of the three types of abuse (i.e. physical, emotional, or sexual) are twice as likely to suffer from migraine than their non-abused peers.[69] Moreover, increased prevalence of migraine and headaches in adult survivors of physical abuse has been documented[20] and has been suggested to be linked to the neurological effects of abuse on brain functions.[14,70] Early stress has been found to be involved in the pathogenesis of migraine and headaches.[71,72]

We also found that the risk of having headaches was almost doubled among adolescents who reported that they have a parent with alcohol use problems. In fact, the increased prevalence of headaches in adolescents with this kind of familial problems could be environmental. For instance, it has been noted that children of alcoholic parents are often victims of physical abuse [73,74] or neglect[75,76] and that, as a result, these youngsters may develop stress-related health problems like headaches and migraines.[20,77]

In adolescents belonging to the PPA group, the prevalences of gluten intolerance and complaints for diarrhea/constipation were significantly increased. The relationship between abuse history and gastrointestinal problems may be explained by the fact that abuse history, by virtue of its multicomponent psycho-physiological effects, can influence gastrointestinal reactivity, either directly or indirectly as a consequence of psychological comorbidities.[78] This can occur via changes in gut motility, especially as there are a variety of neural and humoral pathways that link brain and gut, which may be influenced by the exposure to stress.[79]

Furthermore, exposure to stress results in an alteration of the brain–gut interactions.[80] This alteration in the gastrointestinal system is among the predisposing factors that may contribute to the development of gluten intolerance symptoms.[81] In addition, stress alters the structure and composition of the enteric nervous system that orchestrates various gastrointestinal functions.[82] Consequently, changes of the enteric nervous system may also be associated with gastrointestinal disorders.[83]

We also found that the risk of diabetes was tripled for adolescents in the PPA group. This result may be explained by the fact that stressful experiences may lead to the activation of the hypothalamic–pituitary–adrenal (HPA) axis, leading in turn to various endocrine abnormalities (such as high cortisol) and cytokine-mediated immunologic responses, which may play an important role in the development of diabetes by contributing to insulin resistance.[84,85]

Finally, our results showed that the risk of asthma was one and a half times increased in those reporting a parent with alcohol use problems and nearly doubled in those reporting the experience of PPA. Again, stressful life events have been identified as a risk factor affecting the onset, progression, and severity of asthma in adolescents.[86,87] The relationship between stressful life events and asthma may be associated with the alteration of immune function through the release of HPA's and sympatho medullary pathway's hormones, as well as of inflammatory cytokines (IL-5, IL-13, IL-4, and IFN-γ).[88,89]

Conclusion

A majority of Moroccan adolescents from urban high schools report the existence of some somatic complaint. The most frequent complaints are headaches, diarrhea and/or constipation, and allergies. Female students suffer from somatic complaints more often than their male classmates. The experience of PPA is associated with increased prevalence of somatic problems.

The present findings highlight the importance of screening for parental alcohol use problems and for the experience of PPA when treating adolescents with somatic health problems. Our results strengthen previous findings and emphasize the importance of cooperation between social support and healthcare personnel when managing the recovery of adolescents who have experienced abuse.

Limitations

The study had a cross-sectional design; consequently, no conclusions about causal associations should be drawn. Headaches and constipation/diarrhea were the most frequently reported somatic problems among Moroccan adolescents; however, these complaints may vary greatly in the same individual over a short time period, which may affect the reliability of the report. A respondent who has experienced headaches or gastrointestinal problems just before answering the questionnaire may be more prone to acknowledging the existence of these problems during the past year. Conversely, the absence of these complaints during the recent past may lead the respondent to forget about them and deny the existence of these complaints when assessed over a 12-month perspective. This tendency was recognized by our test–retest assessment as well, which found that these items varied the most (but not significantly) over a 2-week interval. The reliability of the assessment of these complaints over a 1-year period should therefore be interpreted with caution.

Moreover, the higher prevalence of headaches and gastrointestinal problems may be coupled to the menstrual cycle of girls, for which no correction was made in this study.

The assessment of the presence of parental alcohol use problems or the experience of PPA did not include any structured measures or archive or register information; consequently, the assessment of abuse did not consider the degree or frequency of abuse, any associated disability, or information on the specific type of abuse experienced by the adolescent.

Furthermore, due to the anonymous data collection method and the lack of healthcare registers in Morocco, the prevalence of the medical diagnoses among the surveyed adolescents relied on self-reports and could not be checked against actual medical records.

It is noteworthy that, based on the recognized limitations of the assessed data, an improved version of the survey has been developed for future use in the MeSHe project.

Compliance with ethical standards

All procedures performed in the course of this study involving human participants were carried out in accordance with the ethical standards of the Faculty of Science, University Abdelmalek Essaadi, Tetouan, Morocco, and with the 1964 Declaration of Helsinki and its later amendments.

Declaration of conflicting interests

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

Ethical approval

The Regional Directorate of the Ministry of National Education in Tetouan, responsible for managing and directing all matters concerning students from primary to high school education at Tetouan province, retrospectively authorized the study and registered this authorization under the number 85 (2019). The study was also approved by the Faculty of Science, University Abdelmalek Essaadi. This last document does not have a number, therefore the authors enclose it. The use of the survey was approved by the concerned high school directors and by the high school parent associations.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Participation in the study was voluntary and anonymous. The cover page of the survey informed the participants about the questionnaire's content and the aims of the study, and they also received oral information, during which, they had the freedom to choose whether or not to participate in the anonymous data collection. In addition, the cover page of the survey (uploaded as supplementary file) contained the following statement: "If you accept to participate in this study please fill in the questionnaire below. If you do not agree to participate, please return the questionnaire without completing it." Consequently, the completion of the survey was considered as consent of participation. No additional written consent was obtained from the legally authorized representatives of students, as there was no way to identify respondents and thereby neither their parents. However, the use of the survey was approved by the high school parent associations prior to its use.

Supplemental material

Supplemental material for this article is available online.

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Zouini *et al. Ann Gen Psychiatry* (2019) 18:27
https://doi.org/10.1186/s12991-019-0251-5

Annals of General Psychiatry

PRIMARY RESEARCH Open Access

Mental health profile and its relation with parental alcohol use problems and/or the experience of abuse in a sample of Moroccan high school students: an explorative study

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Abstract

Background: Studies on mental health are scarce from Arab countries, especially studies focusing on adolescents. In addition to the neurobiological and physiological changes that occur during adolescent development, psychological, societal and cultural influences have strong effects on adolescents' behavior and on their somatic and mental health. The present study aimed (1) to describe the mental health profile, operationalized as psychological distress, of a sample of Moroccan adolescents, and (2) to investigate how specific psychosocial factors (parental alcohol use problems and the experience of physical and/or psychological abuse) may affect adolescents' mental health.

Methods: The sample included 375 adolescents from conveniently selected classes of four high schools in the city of Tetouan in Morocco. The participants responded to an anonymous survey containing, beside other inventories, the Brief Symptom Inventory (BSI) and identified those reporting parental alcohol use problems and/or the previous experience of abuse. The sample characteristics were defined using descriptive statistics. The effects of the defined psychosocial factors were identified using the Kruskal–Wallis test, followed by the post hoc Fisher's least significant difference test.

Results: The most common problems found in high school students from an urban region of Morocco were memory problems, concentration difficulties, restlessness, fear, nervosity and feelings of inadequacy during interpersonal interactions. The female students reported significantly higher psychological distress levels when compared to the male students ($p < 0.001$). The adolescents reporting parental alcohol use problems and the experience of physical/psychological abuse showed significantly higher levels of psychological distress ($p = 0.02$), especially symptoms of somatization ($p < 0.001$), hostility ($p = 0.005$) and anxiety ($p = 0.01$), than those not reporting any of these psychosocial factors.

Conclusion: The mental health profile of female adolescents from an urban area of Morocco is worse than that of their male fellow students. Adolescents reporting parental alcohol use problems and/or the experience of physical/psychological abuse need synchronized support from social- and healthcare services.

Keywords: Adolescents, Brief Symptom Inventory, Experience of abuse, Mental health, Morocco, Parental alcohol use problems

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Introduction

Adolescence is a period of life with specific health and developmental needs. It is one of the most rapid phases of human development, during which adolescents form their identity, learn how to control their emotions and relationships, and acquire various abilities and attributes, such as self-reliance, work orientation, social commitment, openness to sociopolitical change, and tolerance of individual and cultural differences [1], as well as skills that can be important for their well-being [2]. In the adolescent brain there is a heightened responsiveness to stimuli (positive and negative) and to socioemotional contexts, while impulse control is still relatively immature [3]. Therefore, this period of life is characterized by various vulnerabilities for the adolescent. The vulnerabilities include both risky behaviors, such as drug abuse or violence, and vulnerability to psychiatric problems [4, 5]. In Morocco, 8.9% of the population, almost three million individuals, are aged between 15 and 19 years [6]. According to a report by the Moroccan Ministry of Health [7], almost every second adolescent (48.9%) has a problem with insomnia, anxiety and/or depression. One in five children and adolescents in Morocco suffers from a mental disorder; in half of these cases the age of onset was 14. These figures can explain why mental health recently emerged as one of Morocco's main health objectives [7, 8].

The lifestyle of an adolescent's parents has a significant effect on his or her well-being [9]. Adolescents whose parents have alcohol use problems are exposed to an increased risk of developing alcohol or drug use problems themselves, as well as an increased risk of encountering serious psychological problems [10]. Indeed, these adolescents report higher levels of depression, anxiety and/or stress than do adolescents whose parents do not have alcohol use problems [11, 12].

Furthermore, the experience of physical and/or psychological abuse during adolescence may be associated with general psychological distress, conduct problems, and aggression [13–17], as well as with increased risk of severe substance abuse problems [13, 18]. Such abuse is often combined in adolescents with lower self-esteem and higher levels of major depression, anxiety disorder and self-harm behavior [13, 19, 20]. In addition, adolescents with a combined history of physical and sexual abuse show higher scores on dissociation and somatization problems than do adolescents without any history of such abuse [21, 22].

The present study describes the psychological distress level in a sample of adolescents from an urban area in Morocco (the city of Tetouan), and investigates the relation between negative psychosocial factors (parental alcohol use problems and/or the experience of physical/psychological abuse) and the adolescents' mental health.

Methods

Study population

This study was carried out within the framework of the "Mental and Somatic Health without borders" (MeSHe) project. MeSHe is an international project focusing on culture-specific patterns of mental health profiles coupled to substance abuse and aggressive antisocial behavior in adolescents [23]. The study population included students ($N=375$; 170 males and 205 females) from conveniently selected tenth-, eleventh- and twelfth-grade classes at four high schools in the city of Tetouan, Morocco. With the authorization of the four school directors, data collection was done in the course of the 2014/15 school year. In total, the four high schools had 97 classes. Two classes from each grade and from each school were selected to participate in the study. In the 24 conveniently selected classes there were 876 students enrolled, of which 375 (43%) participated and completed the survey, representing 2.42% of the entire high school student population in the city of Tetouan ($N=15{,}506$ students spread across 17 high schools). The age range in the study population was 15 to 18 years old and the mean age was 16.56 (SD = 1.04) years.

Measures

MeSHe background inventory

The MeSHe survey includes, beside a list of validated measures of drug and alcohol abuse, antisocial aggressive behavior, and psychological distress, a detailed background questionnaire assessing the respondent's age, gender, and presence of clinically diagnosed physical health problems. The background section of the questionnaire also contains items about environmental, psychosocial factors. Two of these items are stated as follows: "Have you ever been physically and/or psychologically abused?" and "Do you have a parent who has problems with alcohol?". Based on their answers to these two questions, the responding adolescents in this study were classified into either of four groups: Adolescents not reporting having parental alcohol use problems nor the experience of being abused (comparison group: CG) ($n=250$); adolescents reporting parental alcohol use problems (PAP) ($n=33$); adolescents reporting the experience of physical and/or psychological abuse (PPA) ($n=55$); and adolescents reporting both parental alcohol use problems and the experience of physical and/or psychological abuse (PAP + PPA) ($n=19$). Of the 375 students participating in this study, 18 did not answer one or both of these questions, and were consequently excluded from the comparison between groups.

Brief Symptom Inventory

The MeSHe survey includes the Brief Symptom Inventory (BSI), which is a brief form of the Symptom Checklist Revised (SCL-90-R) [24, 25], a self-reporting inventory developed to measure an individual's level of psychological distress [26]. The BSI has been translated into over 24 languages, including Arabic [27]. In this study, the responding adolescents were asked to rate the general influence of each item on their well-being over the past year.

The BSI contains 53 items, each of which is rated on a five-point Likert scale ranging from 0 ("not at all") to 4 ("extremely"). Nine primary symptom dimensions of psychological distress are assessed within the BSI, namely somatization (SOM), obsessive compulsiveness (OBS), interpersonal sensitivity (INS), depression (DEP), anxiety (ANX), hostility (HOS), phobic anxiety (PHOB), paranoid ideation (PAR), and psychoticism (PSY). In addition to the nine symptom dimensions, the Global Severity Index (GSI), an indicator of the current overall level of distress, can be calculated [28].

The BSI can also be used in non-psychiatric adult populations [29, 30] and adolescents [31]. The BSI's acceptable or good validity and its reliability measures have been established [32, 33]. In this study, the internal reliability of the primary symptom dimensions and the GSI was tested using internal consistency (Cronbach's α); it was found to be acceptable for all dimensions and ranged from 0.71 (PSY) to 0.85 (DEP).

Ethical considerations

The MeSHe survey was designed in accordance with the Helsinki Declaration [34] and its completion is voluntary and anonymous. The use of the survey was approved by the parent associations at each of the four high schools included in the study, by the Regional Directorate of the Ministry of National Education in Tetouan (with the registration number 85), responsible for managing and directing all matters concerning students from primary to high school education at Tetouan province, and by the Faculty of Science, University Abdelmalek Essaadi. Completion of the survey was considered as consent to participate.

All potential participants received a short written and oral presentation of the MeSHe project and its aims, and were given opportunity to discuss the project and their eventual participation with a responsible researcher; they were also offered the opportunity to leave the classroom if they did not want to participate in the study. The students were assured that their decision whether or not to participate would have no effect on their school record. The data from the responding students were collected on anonymous survey sheets.

Statistical analysis

The sample characteristics were defined through descriptive statistics using SPSS version 21.0 (IBM). Because the scores of the BSI dimensions were not normally distributed in the study population, non-parametric statistical analyses were used. The Mann–Whitney *U* test was used to compare the scores of male and female students. The Kruskal–Wallis test was applied to compare the means ranks between the adolescents not reporting parental alcohol use problem nor the experience of abuse, the adolescents reporting parental alcohol use problems, the adolescents with experience of physical and/or psychological abuse, and the adolescents reporting both problems.

Post hoc (Fisher's least significant difference) tests were applied for multiple testing regarding the differential interactions between the student groups. All the analyses were two-tailed and the significance level was defined at $p < 0.05$.

Results

Mental health of Moroccan adolescents from an urban area

Table 1 summarizes the mean values for each of the nine primary symptom dimensions of the Brief Symptom Inventory (BSI) and for the General Severity Index (GSI) in the Moroccan student sample. Generally, the responding Moroccan female students reported higher psychological distress when compared to their responding male fellow students. The female students scored significantly higher on all but one of the primary symptom dimensions; the exception being the "hostility" dimension where no significant difference could be measured between the genders. The generally higher psychological distress level in the female students is reflected also in their significantly higher GSI score.

Mental health of Moroccan adolescents reporting parental alcohol use problems or the experience of abuse

The majority of the responding high school students did not report the experience of physical nor psychological abuse (80.5%) and had no parent with alcohol use problems (86.4%). Nevertheless, a substantial number of adolescents reported the experience of physical and/or psychological abuse (14.7%) or the presence of at least one parent with problematic use of alcohol (8.8%). Of the students, 5.1% ($n = 19$) reported that they had experienced both physical and/or psychological abuse and a parent with alcohol use problems. There were significantly more male than female students reporting parental alcohol use problems (males: 11%; females: 7.8%;

Table 1 Self-reported psychiatric problems in the general population of Moroccan adolescents (*N* = 375)

BSI subscales	Moroccan adolescents *M* (SD)	Male (*n* = 144–169)[a] *M* (SD)	Female (*n* = 163–199)[a] *M* (SD)	*p*
Somatization	1.25 (0.83)	0.99 (0.78)	1.47 (0.81)	< 0.001
Obsessive compulsiveness	1.73 (0.83)	1.53 (0.82)	1.90 (0.81)	< 0.001
Psychoticism	1.39 (0.87)	1.26 (0.81)	1.50 (0.9)	0.02
Depression	1.22 (0.89)	1.07 (0.81)	1.34 (0.94)	0.01
Interpersonal sensitivity	1.52 (0.94)	1.17 (0.83)	1.81 (0.92)	< 0.001
Hostility	1.29 (0.82)	1.19 (0.76)	1.38 (0.86)	0.06
Phobic anxiety	1.16 (0.82)	0.96 (0.78)	1.34 (0.82)	< 0.001
Anxiety	1.58 (0.87)	1.24 (0.74)	1.84 (0.88)	< 0.001
Paranoid ideation	1.48 (0.83)	1.36 (0.81)	1.59 (0.83)	0.02
GSI	1.38 (0.68)	1.20 (0.67)	1.54 (0.65)	< 0.001

[a] The number of responses varies for the different subscales of the BSI

$p = 0.002$), or reporting both parental alcohol use problems and the experience of abuse (males: 9.8%; females: 1.6%; $p = 0.03$), whereas there were more female than male students reporting the experience of physical and/or psychological abuse, although this difference did not reach the significance level (females: 17.1%; males: 13.4%; $p = 0.36$). Because of the differences in the gender distribution in the responses to these questions, the level of psychological distress was analyzed separately.

In the PAP group (in both male and female students reporting parental alcohol use problems) none of the nine primary symptom dimension scores differed from the scores of the comparison group (CG).

The male students who reported both parental alcohol use problems and the experience of physical and/or psychological abuse (the PAP + PPA group) scored significantly higher than the male students not reporting any of these problems (CG) in the somatization ($p < 0.001$), the hostility ($p = 0.005$) and the anxiety ($p = 0.01$) primary symptom dimensions, as well as in the GSI ($p = 0.01$) (Table 2). The female students from the PPA group scored significantly higher in the somatization ($p < 0.001$), the obsessive-compulsiveness ($p = 0.01$), the psychoticism ($p = 0.003$), and the anxiety ($p = 0.04$) primary symptom dimensions compared to the female students in the CG; they also indicated significantly higher psychological distress levels in the depression ($p = 0.01$) and the hostility ($p = 0.03$) primary symptom dimensions, as well as in the GSI ($p = 0.005$), compared to the female students in both the CG and PAP groups (Table 3).

Table 2 Self-reported psychological distress in adolescent Moroccan males by psychosocial variable groups

	CG (*n* = 108)	PAP (*n* = 18)	PPA (*n* = 22)	PAP + PPA (*n* = 16)	Difference between groups		
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	Test-stat (*H*)	*p* value	Post hoc
Somatization	0.90 (0.71)	0.94 (0.94)	1.07 (0.72)	1.63 (0.87)	10.42	0.02	CG < PAP + PPA* PAP < PAP + PPA* PPA < PAP + PPA*
Obsessive compulsiveness	1.47 (0.80)	1.65 (1.08)	1.53 (0.92)	1.75 (0.50)	1.73	0.63	NS
Psychoticism	1.17 (0.80)	1.3 (1.00)	1.46 (0.77)	1.55 (0.75)	4.85	0.18	NS
Depression	1.01 (0.82)	1.17 (1.00)	1.07 (0.83)	1.27 (0.49)	2.85	0.41	NS
Interpersonal sensitivity	1.13 (0.83)	1.15 (0.89)	1.00 (0.77)	1.55 (0.89)	3.93	0.27	PPA < PAP + PPA*
Hostility	1.10 (0.72)	1.21 (0.93)	1.18 (0.69)	1.67 (0.79)	7.26	0.06	CG < PAP + PPA* PPA < PAP + PPA*
Phobic anxiety	0.89 (0.74)	0.91 (0.83)	1.04 (0.81)	1.25 (0.90)	2.49	0.48	NS
Anxiety	1.16 (0.70)	1.22 (0.82)	1.25 (0.75)	1.69 (0.79)	5.93	0.11	CG < PAP + PPA*
Paranoid ideation	1.26 (0.73)	1.35 (0.89)	1.60 (1.00)	1.61 (0.86)	3.85	0.28	NS
GSI	1.12 (0.66)	1.28 (0.8)	1.19 (0.7)	1.56 (0.54)	6.28	0.10	CG < PAP + PPA*

CG comparison group, *PAP* adolescents reporting parental alcohol use problems, *PPA* adolescents reporting the experience of physical and/or psychological abuse, *PAP + PPA* adolescents reporting both parental alcohol use problems and the experience of physical and/or psychological abuse

*$p < 0.05$

Table 3 Self-reported psychological distress in adolescent Moroccan females by psychosocial variable groups

	CG ($n=142$)	PAP ($n=15$)	PPA ($n=33$)	PAP + PPA ($n=3$)	Difference between groups		
	(Min–Max)	(Min–Max)	(Min–Max)	(Min–Max)	Test-stat (H)	p value	Post hoc
Somatization	1.40 (0.83)	1.41 (0.77)	1.79 (0.81)	1.76 (0.44)	6.84	0.08	CG < PPA*
Obsessive compulsiveness	1.83 (0.81)	1.56 (0.85)	2.23 (0.74)	2.11 (0.92)	9.04	0.03	CG < PPA* PAP < PPA*
Psychoticism	1.40 (0.91)	1.31 (0.52)	1.92 (0.86)	0.80 (0.69)	12.23	0.01	CG < PPA* PAP < PPA*
Depression	1.22 (0.90)	1.12 (0.62)	1.87 (1.02)	0.94 (0.35)	12.37	0.01	CG < PPA** PAP < PPA*
Interpersonal sensitivity	1.73 (0.90)	1.49 (0.61)	2.03 (0.99)	2.25 (0.66)	6.13	0.10	NS
Hostility	1.27 (0.86)	1.24 (0.60)	1.83 (0.81)	1.40 (0.92)	12.39	0.01	CG < PPA** PAP < PPA*
Phobic anxiety	1.31 (0.83)	1.23 (0.82)	1.50 (0.84)	0.80 (0.00)	2.94	0.40	NS
Anxiety	1.77 (0.88)	1.59 (0.61)	2.12 (0.94)	2.22 (0.36)	4.99	0.17	CG < PPA*
Paranoid ideation	1.53 (0.84)	1.38 (0.58)	1.77 (0.87)	1.27 (0.46)	2.6	0.46	NS
GSI	1.45 (0.64)	1.37 (0.49)	1.92 (0.63)	1.52 (0.16)	13.13	< 0.01	CG < PPA** PAP < PPA*

CG comparison group, *PAP* adolescents reporting parental alcohol use problems, *PPA* adolescents reporting the experience of physical and/or psychological abuse, *PAP + PPA* adolescents reporting both parental alcohol use problems and the experience of physical and/or psychological abuse

*$p < 0.05$; **$p < 0.001$

Discussion

Mental health of Moroccan adolescents from an urban region

To the best of our knowledge, this study is the first to investigate the self-reported mental health of Moroccan adolescents. To measure mental health and symptomatic behavior, the well-known clinical instrument known as the Brief Symptom Inventory (BSI) [24, 26] was used. Although this instrument is most often used in clinical populations to measure treatment effects by assessing the patient's feelings, it is also often used to measure mental health profiles in non-clinical populations as well. For instance, the BSI was used in a study assessing an adolescent sample of the general population in Israel [31]. Said study emphasized the need for culture-specific BSI norm-data in adolescent populations, as significant differences could be shown between American and Israeli adolescents' scores in somatization, hostility, phobic anxiety, paranoid ideation and psychoticism, and between the two group's overall distress score (GSI), with the American students reporting higher psychological distress levels [31, 35]. When we compare the levels of psychological distress reported in this study's sample of Moroccan adolescents with the levels found in American and Israeli adolescents, we note that the Moroccan scores are the highest. However, this comparison should be handled with caution as the data from studies performed so far apart in time. To be able to establish culture-specific differences in adolescents' psychological distress levels, we would need to compare our data with more recent studies. In the absence of such data, our only conclusion can be that adolescents living in a Moroccan urban area in 2014–2015 reported more symptoms and higher levels of psychological distress than did adolescents in developed or developing countries 10–20 years ago.

In line with previous studies [36–41], the scores of the male and female students in the present study differed significantly, with female students reporting more symptoms on all the BSI subscales, with the exception of hostility. Other studies have suggested that being female is associated with a higher prevalence of auditory verbal hallucinations, earlier onset of psychotic illness, greater affiliative need, and greater sensitivity to both conflict and rejection within interpersonal relationships [42–45]. These gender differences in the mental health profile of adolescents may be explained by gender-specific genetic factors [46–48], hormones [49], brain structure, function, circuitry, and pharmacokinetics [50, 51], but also by gender-specific exposure levels to the specific psychosocial environmental risk factors [50, 52].

Mental health of Moroccan adolescents reporting parental alcohol use problems or reporting the experience of abuse

In the present study, we found that significantly more male than female students reported having parental alcohol use problems. These male students also reported high levels of psychological distress, manifested by their higher scores in the somatization, hostility, and anxiety dimensions of the BSI, when compared to their male classmates not reporting any of these problems

(comparison group). These results may be explained by the fact that children of parents with alcohol use disorder exhibit a large probability of an earlier onset of substance use [11], of suffering from neglect [53], and of having cognitive deficit, behavioral and emotional difficulties, and psychosocial adjustment problems [54–57], and of having mental disorders [58]. Consequently, the presence of traumatic experiences in addition to the presence of a parent with problematic alcohol use may increase the risk of neurodevelopmental impairment [59]. Previous research has shown that abused children and adolescents are at higher risk of exhibiting aggression [60–62] and deficits in their emotional regulation [63]. Generally, emotional dysregulation is positively correlated with hostility [64] and represents a risk factor for internalizing problems, such as anxiety and somatic complaints [65].

Our results also show that the female students who reported the experience of physical/psychological abuse also reported higher levels of psychological distress, captured by significantly higher scores in the somatization, obsessive compulsiveness, psychoticism, anxiety, depression and hostility dimensions of the BSI, than did their female classmates in the comparison group. Previous research has found similar results, suggesting that the experience of abuse by female adolescents is significantly associated with anxiety, depression, dissociative disorder, and aggressive behavior [66–68]. Furthermore, previous research has shown that abuse of female adolescents may be associated with dysregulation of their emotional patterns [69], post-traumatic stress disorders [70], and low self-esteem [71], which are strongly linked to internalizing and externalizing behaviors, and negative affect such as depression, anxiety, hostility, somatization and psychoticism [72–74]. In our study population there were significantly more male than female students reporting both parental alcohol use problems and the experience of abuse. This may be an effect of the Islamic culture and education, which dissuades Arab female adolescents from reporting being physically or psychologically abused within their family, which may increase their feelings of solitude and isolation, which in turn are strongly associated with various psychiatric disorders [75–77].

Conclusion

The present study provides the first insights into the self-reported mental health profiles of Moroccan adolescents and underlines the need for new assessments in order to make international comparisons.

The study provides evidence that female high school students report higher psychological distress levels compared to their male classmates. Furthermore, the study confirms the serious and diverse negative relation between parental alcohol use problems and/or of the experience of physical/psychological abuse and the mental health of adolescents. Interventions and support for these adolescents from both social- and healthcare organizations are warranted.

Limitations

The study had a cross-sectional design not allowing any causality analyses. Despite including data from almost 400 adolescents, the study's generalizability is limited; the study population represented only a fraction of all adolescents in Morocco and was selected from schools in only one city. The study's use of self-reporting entails well-known limitations, namely that self-report questionnaires depend on the respondent's ability and willingness to remember and answer truthfully; responses may be distorted by social desirability and recall biases [78].

The assessment of the physical and/or psychological abuse did not include the degree or frequency of abuse, any associated disability, or information on the specific type of abuse experienced by the adolescent. It is noteworthy that, based on this limitation and other recognized limitations of the assessed data, an improved version of the survey has been developed for future use in the MeSHe project.

Abbreviations

ANX: anxiety; BSI: Brief Symptom Inventory; CG: comparison group; DEP: depression; GSI: global severity index; HOS: hostility; INS: interpersonal sensitivity; MeSHe project: Mental and Somatic Health without borders project; OBS: obsessive compulsiveness; PAP: adolescents reporting having parents with alcohol problems; PAP + PPA: adolescents reporting both parental alcohol use problems and the experience of physical and/or psychological abuse; PAR: paranoid ideation; PHOB: phobic anxiety; PPA: adolescents reporting the experience of physical and/or psychological abuse; PSY: psychoticism; SOM: somatization.

Acknowledgements

Open access funding provided by University West.

Authors' contributions

BZ: data collection, data analysis, drafting and revision of the manuscript. AS: statistical assistance, drafting of the manuscript. BHA: intellectual feedback and revision of the manuscript. MS: supervision of data collection, critically important intellectual feedback on the interpretation of the results, revision of the manuscript. NK: design and direction of the "Mental and Somatic Health without boarders (MeSHe)" project, study design, data interpretation, monitoring of manuscript progress and revisions. All authors read and approved the final manuscript.

Funding

The study received no funding.

Availability of data and materials

The data sets used and/or analyzed in the course of this study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

All procedures involving human participants were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. With reference to Morocco, there is no national

ethical committee, but the parent associations of the participating schools, the Regional Directorate of the Ministry of National Education in Tetouan and the Faculty of Science, University Abdelmalek approved the study. Completion of the survey was considered as consent to participate.

Consent for publication
Formal consent for publication is not required for this type of study; participation was voluntary and anonymous. The survey's cover page informed the participants about the questionnaire's content and aim, and stressed that participation in the anonymous data collection was entirely voluntary.

Competing interests
The authors declare that they have no competing interests.

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Received: 15 May 2018 Accepted: 2 December 2019
Published online: 19 December 2019

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Publisher's Note

PSIHOLOGIJA, 2019, OnlineFirst, 1–13 UDC

DOI: https://doi.org/10.2298/PSI181225001Z

Self-reported aggressive and antisocial behaviors in Moroccan high school students*[1]

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The aims of the present study were to map the level and distribution of aggressive and antisocial behaviors in a sample of Moroccan high school students and to define the level of these behaviors in adolescents who reported parental alcohol use problems and/or experienced abuse. In total, 375 high school students completed the "Mental and Somatic Health without borders (MeSHe)" survey that includes the Life History of Aggression scale. Male students had significantly higher scores for aggression and antisocial behaviors than female. The students who reported experience of abuse or parental alcohol use problems scored significantly higher for aggression, self-directed aggression, and antisocial behaviors compared to students not reporting these negative psychosocial factors. Previously shown gender-specific patterns in aggressive and antisocial behaviors, but not in self-harm behaviors were confirmed in these Moroccan high school students. Reported experience of abuse and/or parental alcohol use problems were associated with increased frequency of aggressive and antisocial behaviors.

Key words: adolescents, aggression, antisocial behaviors, abuse, gender, parental alcohol use

Highlights:

- Male students reported higher levels of aggressive and antisocial behaviors than their female classmates.
- No gender differences in self-harm behaviors were observed.
- Aggressive and antisocial behaviors were positively associated with the experience of physical and/or psychological abuse and with parental alcohol use problems.
- Students reporting the experience of physical and/or psychological abuse also reported significantly more frequent self-harm behaviors compared to their classmates.

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* This is an early electronic version of the manuscript that has been accepted for publication in Psihologija journal. Please note that this is not the final version of the article and that it can be subjected to minor changes before final print. Please cite as: Zouini, M., Senhaji, M., & Kerekes, N. (2019). Self-reported aggressive and antisocial behaviors in Moroccan high school students. *Psihologija*. Advance online publication. doi: https://doi.org/10.2298/PSI181225001Z

In Morocco, over three million individuals are aged between 15 and 19 years (High Commission for Planning, 2014). Compared to the population age distributions observed in Western countries, this percentage represents a substantial proportion of Morocco's population, namely 8.9% (High Commission for Planning, 2014). Consequently, the promotion of the health of adolescents is a major focus of several Moroccan government bodies, such as the Ministry of Health and the Ministry of Education and Youth, working together to improve the psychosocial development (United Nations Educational, Scientific and Cultural Organization, 2012). During adolescence, individuals adopt and develop skills for adult life that allow them to make decisions about their lifestyle, learning, relationships and self-autonomy (i.e., Greenberger, 1984; Zarrett & Eccles, 2006). This period of personal development includes several risk factors and increased vulnerability to the possible development of negative life styles, substance use, destructive behaviors and mental ill-health (i.e., Schulte-Körne, 2016; Welsh et al., 2017). Despite its importance, the mental health and well-being of Moroccan adolescents is literally unexplored.

During childhood, the level of aggressive antisocial behavior is measured by the presence of physical aggression, lying, cheating, vandalism, and violation of rules, and is labeled as conduct disorder (Kim-Cohen et al., 2005; Searight et al., 2001). Aggressive behavior is often associated with mental disorders, for instance attention deficit/hyperactivity disorder and autism spectrum disorder (Macmillan, 2014; Kerekes et al., 2014). This association can be explained mainly by the distinct social interaction problems experienced by these youngsters (Kerekes et al., 2014). Childhood and adolescent aggressive and antisocial behaviors have been also associated with defined negative psychosocial factors in the youngster's life. Physical or psychological abuse of children may entail the development of various forms of psychopathology, including both internalizing and externalizing symptoms (Alizzy, Calvete, & Bushman, 2017; De Bellis, 2001; De Sanctis et al., 2012; Jung et al., 2017). Numerous studies have demonstrated that adolescents who experienced abuse as children were more likely to exhibit internalizing problems, such as depression (e.g., Fergusson, Horwood, & Lynskey, 1996; Moylan et al., 2010; Widom, 2000; Wolfe et al., 2001), as well as externalizing behavior problems, such as delinquency and violent criminality (Fergusson, Horwood, & Lynskey, 1996; Fergusson & Lynskey, 1997; Herrenkohl, Egolf, & Herrenkohl, 1997; McCabe et al., 2005; Moylan et al., 2010; Smith & Thornberry, 1995; Widom, 2000; Wolfe, 1999). The experience of parental alcohol use problems during childhood, with or without the experience of abuse, has also been found to be associated with conduct and emotional problems (Christensen & Bilenberg, 2000), as well as a variety of internalizing and externalizing behaviors (Hussong et al., 2008; Hussong et al., 2010).

In the present study we aimed to define the level, type and gender-specific distribution of self-reported aggressive and antisocial behaviors in an urban sample of Moroccan high school students. In addition, the aim was to analyze the associations between parental alcohol use problems or experiencing physical/psychological abuse and levels of aggressive and antisocial behaviors.

Method

Study Population

This study was carried out within the framework of the "Mental and Somatic Health without borders" (MeSHe) project (http://meshe.se), which is an international project focusing on culture-specific patterns of mental health coupled to substance use and aggressive antisocial behavior in adolescents. The study population included high school students (N = 375; 45.3 % male) conveniently selected from classes including the 10th, 11th, and 12th grades of four high schools in the Moroccan city of Tetouan. During the academical year of 2014/15 data was collected from four high schools, which housed 97 classes of 10th, 11th and 12th grades. Two classes from each grade and from each school were selected to participate in the study. In these 24 classes there were 876 students enrolled, of which 375 (43%) completed the survey.This sample represents a conveniently selected 2.42% of the high school student population in Tetouan (N = 15 506 students spread across 17 high schools). The age range of the participants was from 15 to 18 (M = 16.56 SD =1.04) years.

Measures

Background inventory. Age, gender, the presence of clinically diagnosed somatic and/or mental health problems, and psychosocial environmental factors were assessed by a background questionnaire. Two questions of importance for the present study were "Have you ever been physically and/or psychologically abused?" and "Do you have a parent who has problems with alcohol?".

Life history of aggression. The Life History of Aggression scale (LHA; Coccaro, Berman & Kavoussi, 1997) measures the occurrence of aggressive and antisocial behaviors from the age of 13 years. For the data collection in the Moroccan high school student population, the Arabic version of the MeSHe survey was used including the Arabic translation of the LHA. The translations were performed in two steps: the first step was to translate LHA from English to Arabic and the second step was a back-translation by an independent translator from Arabic to English. After several adjustments, the project leader (NK) approved a final version of the Arabic LHA. The LHA total scale consists of three subscales: (1) a five-item Aggression subscale (measuring temper tantrums, verbal aggression, fighting, physical assault, and destruction of property); (2) a four-item Antisocial Behavior subscale (assessing school behavioral problems, problems with supervisors, antisocial behavior not involving the police, and antisocial behavior involving the police); and (3) a two-item Self-Directed Aggression subscale (reporting suicidal and self-harm behavior). All items are scored on a six-point Likert scale based on the total number of occurrences of the behavior. The scores are coded as follows: 0 = *no occurrences*, 1 = *one occurrence*, 2 = *two or three occurrences*, 3 = *four to nine occurrences*, 4 = 10 *or more occurrences recalled*, or 5 = *more occurrences than can be counted*. In this study, the LHA total scale's Cronbach's alpha for internal consistency was .74.

Ethical Considerations

The MeSHe survey is designed in accordance with the Helsinki declaration (World Medical Association, 1964) and its completion is voluntary and anonymous. All potential participants received a short written and oral presentation of the MeSHe project and its aims. They were offered opportunities to discuss the study and their participation therein with a responsible researcher. They were also informed that they were free to leave the classroom if they did not wish to participate in the study, and they were assured that their decision whether to participate in the study would in no way affect their academic file. The data were collected on anonymous survey sheets in order to guarantee the respondents' anonymity. Completion of the survey was considered as consent to participate. The survey was approved with the registration number 557, by the Regional Directorate of the Ministry of National Education in Tétouan, responsible for

managing and directing all matters concerning students from primary to high school education at Tetouan province and by the Faculty of Science, University Abdelmalek Essaadi. The use of the survey also was approved by each high school's director and parents' association.

Statistical Analysis

Sample characteristics were described by descriptive statistics. Because LHA scores were not normally distributed in the study population, non-parametric statistical analysis was used. The Mann-Whitney U-test was used for comparing LHA scores for males and females. The Kruskal-Wallis H-test was applied to compare the means ranks between adolescents reporting neither parental alcohol use problems or experience of abuse (CG), adolescents reporting parental alcohol use problems (PAP), adolescents reporting experience of physical and/or psychological abuse (PPA), and adolescents reporting both parental alcohol use problems and some form of abuse (PAP + PPA). Of the 375 students participating in this study, 18 did not answer one or both of the psychosocial environmental questions and were therefore excluded from the comparison between groups. Based on their answers to these two questions the adolescents were classified into either of four groups: (1) high school students not reporting having parents with alcohol problems or the experience of being abused (Comparison Group, CG; n = 250); (2) high school students reporting having parents with alcohol problems (PAP; n = 33); (3) high school students reporting the experience of physical and/or psychological abuse (PPA; n = 55); or (4) high school students reporting both parental alcohol use problems and the experience of physical and/or psychological abuse (PAP + PPA; n = 19). Post hoc (Fisher's least significant difference) tests were applied for multiple testing regarding the differential interactions between these groups. All the analyses were two-tailed, and the significance level was defined at $p < .05$.

Results

The mean LHA total score was 8.64 (SD = 7.49; Table 1) for the entire sample. Males (n = 165–169, depending on the subscales scores) had significantly ($p < .001$) higher LHA total scores, as well as the Aggression subscale and Antisocial Behavior subscale scores compared to females (n = 196–204, depending on the subscales). There were no statistically significant differences in the Self-Directed Aggression subscale score (Table 1). On the LHA total scale, 8.6% of the participants (6.1% of the males and 10.7% of the females) scored zero. On the subscale level, 9.1% (6.6% of the males and 11.1% of the females) scored zero on the Aggression subscale, 70.5% (71.4% of the males and 69.7% of the females) scored zero on the Self-Directed Aggression subscale, and 74.3% (61.5% of the males and 84.8% of the females) scored zero on the Antisocial Behavior subscale.

Table 1
Mean (SD) values of the Life History of Aggression (LHA)

Score	Total *M (SD)*	Males *M (SD)*	Females *M (SD)*	U-test	p^a
Total	8.64 (7.49)	10.53 (8.31)	7.05 (6.31)	11991	<.001
Aggression	6.93 (5.35)	8.16 (5.75)	5.9 (4.77)	12677.5	<.001
Self-Directed Aggression	0.76 (1.52)	0.73 (1.4)	0.8 (1.62)	16651.5	.78
Antisocial Behavior	0.93 (2.35)	1.63 (3.17)	0.34 (1.01)	12921.5	<.001

Note. LHA = Life History of Aggression.

[a] significance by Mann-Whitney U-test

In overall, 55 (15.4%) students reported the experience of physical and/or psychological abuse, while 33 (9.2%) reported having at least one parent with problematic use of alcohol. Of all, 19 (5.3%) students reported to have experienced both physical and/or psychological abuse and having at least one parent with alcohol use problems. The results of the Kruskal-Wallis test showed significance difference ($p < .001$) between the groups (CG, PAP, PPA and PAP+PPA) in the LHA total scale and the subscales scores. Students from each of the three groups (PAP, PPA, and PAP+PPA) scored significantly higher ($p < .001$) on LHA total ($p = .001$, $p < .001$, $p = .001$, respectively), Aggression ($p = .01$, $p < .001$, $p = .002$, respectively), and Antisocial Behaviors ($p <. 001$, $p = .001$, $p = .01$, respectively) subscales compared to students from the CG (Table 2). On the Self-Directed Aggression subscale students reporting the experience of abuse (belonging to the PPA or PAP+PPA groups) had significantly higher scores ($p < .001$, $p = .02$, respectively) compared to the students in the CG. In addition, students from the PPA group had significantly ($p = .02$) higher scores than students in the PAP group (Table 2).

Table 2
Life History of Aggression scores according to different groups

Score		CG ($n = 250$)	PAP ($n = 33$)	PPA ($n = 55$)	PAP+PPA ($n = 19$)	Difference between groups	
						H	Post hoc analysis: p[a]
Total	*M*	7.02	11.38	12.93	13.06	42.36 ***	CG vs. PAP: .001 CG vs. PPA: <.001 CG vs. PPA+PAP: .001
	(SD)	(6.48)	(8.6)	(8.5)	(8.05)		
Aggression subscale	*M*	5.93	8.39	9.67	9.89	30.51 ***	CG vs. PPA: <.001 CG vs. PAP: .01 CG vs. PAP+PPA: .002
	(SD)	(4. 9)	(5.77)	(5.67)	(5.69)		
Self-Directed Aggression subscale	*M*	0.53	0.81	1.58	1.37	28.83***	CG vs. PPA: <.001 CG vs. PPA+PAP: .02 PAP vs. PPA: .02
	(SD)	(1.31)	(1.5)	(2.12)	(1.57)		
Antisocial Behavior subscale	*M*	0.55	2.06	1.65	1.95	27.94***	CG vs. PAP: <.001 CG vs. PPA: .001 CG vs. PAP+PPA: .01
	(SD)	(1.68)	(4)	(3.04)	(2.86)		

Note. CG = Comparison Group; PAP = High school students reporting Parental Alcohol use Problems; PPA = High school students reporting the experience of Physical and/or Psychological Abuse; PAP+PPA = High school students reporting both PAP and PPA.

*** $p < .001$

[a] significance by Post Hoc test

Discussion

Moroccan male high school students reported significantly higher levels of antisocial and aggressive behaviors than their female classmates. This gender aspect of aggressive and antisocial behaviors has been observed long ago. In the 1980s, it was commonly agreed that males exhibit greater levels of aggression than females (e.g., Maccoby & Jacklin, 1980). In the 1990s, the argument was made that males and females express aggression in different ways

and that one should view the matter of gender-specific aggression more in terms of qualitative than quantitative differences (e.g., Björkqvist, 1994). Nowadays, a softer conclusion is drawn from ongoing sociopsychological studies, namely that males are slightly more aggressive than females (Finigan-Carr et al., 2016; Shaheen & Jahan, 2014). Various factors are hypothesized to explain both the qualitative and quantitative differences in aggression levels, for instance potential biological and evolutionary influences (Archer, 2004), associations between testosterone levels and aggressiveness during adolescence (Yi-Zhen & Jun-Xia, 2009), psychosocial health profiles (Piko, Keresztes, & Pluhar, 2006), and parental differential treatment of males and females (Mandara et al., 2012).

The scores in terms of aggressive and antisocial behaviors in our sample showed a strongly skewed distribution. Most of the students scored zero or only a few points while there were few students with high scores. The mean of the Aggression and Antisocial Behavior subscales' score (M = 7.86; SD = 6.68) found in the present study was very similar to that obtained in 18 years old Swedish twins (M = 7.90; SD = 6.45) (Hovey et al., 2016). The general lack of relevant comparison data internationally points to a need for further studies on aggressive and antisocial behaviors, in order to be able to describe cultural differences in the general population and, particularly, in young adults.

The present study reinforces the general finding that Moroccan males engage in more frequent and more serious extrovert aggressive acts compared to females (i.e., Finigan-Carr et al., 2016; Shaheen & Jahan, 2014; Yi-Zhen & Jun-Xia, 2009), but no gender differences could be measured in the frequency of self-harm behaviors, which seems to contradict a previous report. Among Australian adolescents, self-harm behavior was significantly more frequent in females (10%) than in males (6%) (Moran et al., 2012), whereas in the Moroccan sample we did not find any significant difference in the frequency of self-harm behavior between male (0.73%) and female (0.76%) students. The higher incidence of self-harm in Australian females during adolescence was independently associated with the presence of depression, anxiety, social problems, high-risk alcohol use, cannabis use, and cigarette smoking (Moran et al., 2012). The absence of gender-specific differences in the frequency of self-harm obtained in the present study despite the fact that Moroccan high school females report a higher level of psychological distress, including anxiety and depression, than their male classmates (Zouini et al., submitted), may be related to the collectivist Moroccan culture, which may provide a protective factor against the manifestation of anxiety in the form of self-harm behaviors. In fact, it has been found that belief in Islam reduces suicide rates (Shah & Chandia, 2010), and that these considerably lower rates of suicide and self-directed aggression seen generally in Muslim population could be explained by respect for the normative structures of collectivism, which values the acceptance of traditional authority, and the adherence to religious and moral traditions (Kemmelmeier et al., 2002).

The question whether aggressive and antisocial behaviors in adolescents are related to psychosocial factors is of major importance. Various studies in this area have shown positive associations between parental alcohol use problems/

dependence and conduct disorder or severe aggressive and antisocial behaviors in children (Finan et al., 2015; Gabel & Shindledecker, 1993; Keller et al., 2011). Our results agree with these studies. We found that students who reported that they had at least one parent with alcohol use problems also reported increased levels of aggressive and antisocial behaviors, overt aggression, and norm-breaking behaviors in comparison to students who did not report parental alcohol use problems. These results may be explained by the fact that parental alcohol use is often combined with family discord and dysfunction (Dube et al., 2001; Rothenberg, Hussong, & Chassin, 2017), paternal criminality or antisocial behavior (Corman & Mocan, 2015; Hammerton et al., 2017), parental psychiatric illness (Grant et al., 2015), and child abuse (Dube et al., 2001). These parental factors (including parental alcohol use problems) affect the child's socioemotional and cognitive development and may provide the foundation for the development of an aggressive, antisocial behavior pattern in the youngster (Barnow et al., 2002; Bennett et al., 1988; Jansen et al., 1995; Keller et al., 2008).

Our results also show that students reporting the experience of physical and/or psychological abuse scored significantly higher in the self-reported measure of aggressive and antisocial traits, overt aggression and norm-breaking behavior, than those not reporting these negative experiences. These results may be explained by the "cycle of violence theory" (Widom, 1989a), which suggests that exposure to abuse in childhood increases the risk of engaging in violent criminal offenses or aggressive behavior in adolescence (Widom, 1989b), and by the fact that the experience of childhood abuse may be heavily involved in a developmental pathway leading to the possible onset of post-traumatic stress disorder and depression (Powers et al., 2015; Wielaard et al., 2018), consequently increasing future levels of aggressive and antisocial behaviors (Auslander et al., 2016; Kendra, Bell, & Guimond, 2012). However, the connection between childhood abuse and adolescent aggression has also been explained by social learning theory hypotheses suggesting that aggression may be a learned behavior through direct or observed violent interactions (Burton, Miller, & Shill, 2002). According to this explanation, the more frequent and intense the adolescents' traumatic events are, such as physical or psychological abuse, the more likely it is that they learn to engage in aggressive behavior. Similarly, adolescents may choose to be aggressive towards themselves or others, in order to cope with their own feelings, thus repeating what they have learned from their attackers (Felson & Lane, 2009).

The frequency of self-harm behavior in students reporting the experience of physical and/or psychological abuse was also significantly higher when compared to students who did not report any negative psychosocial factors, but also when compared to those who reported parental alcohol use problems. Indeed, Zoroglu et al. (2003) found a significant relationship between the number of different types of abuse (emotional, sexual, physical) and self-harm behaviors in Turkish high school students. The rate of suicide attempts and self-mutilation behaviors was increased 7.6 and 2.7-fold, respectively, in abused Turkish high school students compared to those not reporting any type of abuse (Zoroglu et al., 2003). The significant increase in self-harm injuries in abused adolescents was

associated with adverse contextual factors, including the family environment, the characteristics of the adolescents' relationship with their parents, and the characteristics of the perceived parenting style, as well as psychiatric ill-health in the adolescent (the existence of diagnoses such as depression, disruptive behavior disorders, and/or substance abuse and dependence) (Brown et al., 1999; Burešová et al., 2015; Kaplan et al., 1997).

Interventions focused on enhancing prosocial skills and preventing the development of persistent aggressive and antisocial behavior may be important for promoting behavioral adjustments and increased well-being in adolescents living in negative psychosocial environments.

Limitations

Several limitations of the study must be discussed. First, the study has a cross-sectional design not allowing causality analyses. In addition, although the study included data from high school students conveniently selected, it is a limitation that all the schools were from one city (Tetouan) and that the study population size is only a small fraction of all high school students in this city and in the whole country. These limitations relating to the data collection strongly restrict the generalizability of the results. Furthermore, the assessment method included only one self-report. Similarly, the assessment of the negative psychosocial factors (presence of parental alcohol use problems or the experience of physical and/or psychological abuse) did not include any structured measures, archive or register information; consequently, the assessment of abuse did not include the degree or frequency of abuse, any associated disability, or information on the specific type of abuse experienced by the high school students.

Conclusion

Our results from a population of Moroccan high school students confirmed the previously reported gender differences in aggressive and antisocial behaviors, but not in regard to self-harm behaviors. The study also showed that parental alcohol use problems or the experience of physical and/or psychological abuse are associated with increased levels of aggressive and antisocial behaviors, while the experience of abuse is coupled to increased proneness to self-harm behavior. These results emphasize the need for support for adolescents with experience of abuse and/or parental alcohol use problems. Future studies confirming our data and addressing the limitations of this study should further extend the findings in order to draw valid recommendations for interventions.

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Samoprocena agresivnog i antisocijalnog ponašanja kod marokanskih srednjoškolaca

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Ciljevi ove studije su bili mapiranje nivoa i distibucije agresivnog i antisocijalnog ponašanja kod marokanskih srednjoškolaca (Maroko je država u severozapadnoj Africi, prim. prev.) i određivanje prisustva ovih ponašanja kod adolescenata koji su naveli da njihovi roditelji imaju probleme vezane za upotrebu alkohola i/ili da su bili zlostavljani. Ukupno 375 srednjoškolaca je učestvovalo u studiji "Mentalno i telesno zdravlje bez granica" (eng. Mental and Somatic Health without borders; MeSHe) u okviru koje su, između ostalog, odgovarali i na Skalu životne istorije agresivnosti (eng. Life History of Aggression scale). Učenici su postigli značajno više skorove na agresivnosti i antisocijalnom ponašanju od učenica. Učenici koji su naveli da su njihovi roditelji imali probleme vezane za upotrebu alkohola ili da su bili zlostavljani imali su značajno više skorove na agresivnosti, agresivnosti usmerenoj prema

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sebi i na antisocijalnom ponašanju u odnosu na učenike koji nisu izvestili o ovim negativnim činiocima. Prethodno utvrđeni polno specifični obrasci agresivnog i antisocijlanog ponašanja su potvrđeni kod ovih marokasnkih srednjoškolaca. Postojanje polno specifičnih obrazaca nije potvrđeno kada je u pitanju samopovređivanje. Navođenje (u upitniku iz studije, prim. prev) da su bili zlostavljani i da roditelji imaju probleme vezane za upotrebu alkohola bili su povezani sa nivoom agresivnosti učenika.

Ključne reči: adolescenti, agresija, antisocijalno ponašanje, zlostavljanje, rod, roditelji koji koriste alkohol.

RECEIVED 25.12.2018.
REVISION RECEIVED 17.02.2019.
ACCEPTED 29.03.2019.

2019 Adolescents' health and its relation with negative psychosocial factors in a sample of Moroccan high school students ZOUINI BTISSAME

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Dépôt Légal: 2019MO3558
ISBN 978-9920-38-138-3