Self-inflicted injuries in adolescents and young adults: A longitudinal approach

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Abstract

Background: Suicide has become a major global public health problem in some clinical subpopulations. Adolescents and young adults with self-inflicted injuries or non-suicidal self-harm appear to have been understudied. The aim of this study is to assess which socio-demographic and prior co-morbid psychopathology condition variables in adolescents and young adults with self-inflicted lesions are likely to be more predictive of future self-injury after 12 months. Method: The eligible participants were 176 people (99 women and 77 men) aged 15-25 (mean = 20.3; SD = 4.56) who were subsequently divided into two groups (those who had been admitted again for self-inflicted injuries or non-suicidal self-harm (104; 59.1%), and those who had not (72; 40.9%) during the following 12 months. Results: The results obtained offer (i) a specific socio-demographic profile in which women (OR [CI95%] = 6.22[6.03-7.11]) aged 21-22 (OR [CI95%] = 4.71[4.29-5.73]) who are students (OR [CI95%] = 2.99[1.58-6.01]) are likely to inflict a new self-injury on themselves after 12 months, and (ii) a clear clinical profile where several afflications are predictors of a new self-injury after 12 months. Conclusions: We discuss the urgent need to develop specific health protocols and improve public health alert measures for certain subpopulations.

Keywords: Epidemiology, psychosocial profile, clinical protocols, self-inflicted injuries.

Resumen

Lesiones autoinfligidas en adolescentes y jóvenes: un enfoque longitudinal. Antecedentes: el suicidio se ha convertido en un verdadero problema de salud pública mundial en algunas subpoblaciones clínicas. Los adolescentes y adultos jóvenes con lesiones autoinfligidas o autolesiones no suicidas parecen haber sido poco estudiados. El objetivo de este estudio es evaluar qué variables sociodemográficas y comorbilidad psicopatológica previa en adolescentes y adultos jóvenes con lesiones autoinfligidas son más propensas a predecir una autolesión futura después de 12 meses. Método: 176 personas (99 mujeres y 77 hombres) de entre 15 y 25 años (media = 20.3; DE = 4.56) divididos en dos grupos: los ingresados nuevamente por lesiones autoinfligidas o autolesiones no suicidas (104; 59.1%) y aquellos que no lo hicieron (72; 40.9%) durante los siguientes 12 meses. Resultados: los resultados ofrecen (i) un perfil sociodemográfico específico caracterizado por mujeres (OR [CI95%] = 6.22 [6.03-7.11]) de 21 a 22 años (OR [CI95%] = 4.71 [4.29-5.73]) y estudiantes (OR [CI95%] = 2.99 [1.58-6.01]) que pueden autoinfligirse una nueva autolesión después de 12 meses, y (ii) un perfil de comorbilidades psicopatológicas previas claras donde varios trasmorfos son predictores de una nueva autolesión después de 12 meses. Conclusiones: discutimos la urgencia de desarrollar protocolos de salud específicos y mejorar las medidas de alerta de salud pública para ciertas subpoblaciones.

Palabras clave: epidemiología, perfil psicosocial, protocolos sanitarios, lesiones autoinfligidas.
conditions and comorbid psychopathology of adolescents and young adults are associated with subsequent suicide attempts (Ribeiro et al., 2019), for which we used their exact date of admission and 12 months after the first suicide attempt (Hill & Pettit, 2014). In this regard, previous attempts are of particular interest, since more than half of the population of completed suicides die on their first attempt (Jordan & McNeill, 2019). There must be predictive variables that report on suicidal vulnerability after one or more self-inflicted injuries in early adolescence and youth, before the first serious suicide attempt (Hill & Pettit, 2014). If we can identify these variables, early prevention and intervention actions could be implemented in this clinical subpopulation before the first serious approach to suicidal behaviour occurs (Sánchez-Teruel & Robles-Bello, 2014). Since previous self-inflicted injuries could already be considered indicative of this approach – since it shows an ability to harm oneself – the variables involved in the transition to desire or the first attempt to die should be further analysed (Dhingra, Klonsky, & Tapola, 2019).

In Spain, few studies have analysed the sociodemographic conditions and comorbid psychopathology of adolescents and young adults who have previously suffered self-inlicted injuries. We have also found that while there is clear evidence that these variables, on first admission to the emergency department, may predict long-term suicide (Aaltoinen, Isometsä, Sund, & Pirkola, 2019), there are not many studies that have addressed those of adolescents and young adults who have previously suffered self-injury.

The aim of this study was to evaluate which sociodemographic variables and comorbid psychopathological conditions in adolescents and young adults who have suffered previous self-injury are most predictive of future self-injury at 12 months after the first injury, as well as to assess health care performance in hospital emergency departments after the intervention on physical injuries.

Method

Participants

The total sample was made up of 832 digital medical records of individuals admitted to the emergency room of several hospitals in two Andalusian provinces (Cordoba and Jaen). The average population of the analyzed area during the study period was 280,987. The total number of people admitted to the emergency room of the hospitals in the analyzed area was 2742 (2467 admissions). The eligibility criteria were the following: individuals aged 15-25 with a diagnosis of self-inflicted lesions (SIL) or non-suicidal self-injury (NSSI) during the years 2013, 2014 and 2015 (study period). The exclusion criterion used was readmission for two or more times during the study period. Only 176 individuals (99 women and 77 men: mean = 20.3; SD = 4.56) bearing different socio-demographic and previous co-morbid psychopathology conditions characteristics were selected from the original sample (Table 1). Subsequently, each participant was scrutinized over 12 months throughout 2016 and 2017, for which we used their exact date of admission and digital health record number. The sample was divided once more into those individuals who had been admitted again for self-inflicted injuries or non-suicidal self-harm (104; 59.1%) and those who, over the same period, had not (72; 40.9%). We noted that there were no differences between the two groups (NSSI = non-suicidal self-injury; RANSSI = re-attempt non-suicidal self-injury) in any of the socio-demographic and previous co-morbid psychopathology conditions variables assessed ($\chi^2$ = between 1.11 and 19.22, $p>0.05$). In addition, we noted that all variables presented an adequate size of effect ($\eta^2$ = between .16 and .98) and an adequate statistical power (between .10 and 1.12), as can be checked in table 1.

On carrying out our study, Spain's Law on the Protection of Personal Data (1999) was never infringed. Some positive assessments were granted too by the University of Jaen’s Research Ethics Committee and the Andalusian Regional Government’s Health Service Research Ethics Committee.

Instruments

Our research profited from the assistance of some previously trained emergency healthcare personnel, who generously obtained the raw data (i.e. the digital health records) needed to complete the target sample and subsequently fed it into a database, with

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**Table 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N (%)</th>
<th>$\eta^2$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>176 (104; 72)</td>
<td>.85</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Gender</td>
<td>0.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Previous co-morbid psychopathology conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health status</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Previous self-injury</strong></td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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all the variables under scrutiny, by means of an integrated management and information system for healthcare developed by the Andalusian Regional Government. The system, running on the DIRAYA software, advantageously replaces the traditional paper health records with a number of digital clinical (health, illness, treatment) records, thus ensuring ultra-rapid communications, exclusive access by authorized healthcare personnel and total confidentiality.

All variables in this research (Table 1) were obtained from the digital medical records of each participant, including previous co-morbid psychopathology conditions made by emergency medical staff and triggering situation obtained by nursing staff in emergency triage consultation. The data collected from the clinical records (digital or paper) are appropriate instruments for assessing mental health and suicide risk (García-Nieto et al., 2012).

**Procedure**

We requested access permits from hospital managements and leaves to proceed from Research Ethics Committees, and they were both granted. Subsequently, we asked some hospital emergency room personnel to cooperate, and they accepted to be trained to collect data on variables of interest on two separate sessions. At the time of the study, the cooperating hospital personnel had between 8 and 15 years of professional experience in their places of work. Data collection took from 4 to 6 months throughout the year 2018.
Data analysis

Initially we evaluated multivariate normality, sample multicollinearity and measurement of error independence of independent variables (IVs). Later on, we transformed artificially the dichotomous nominal dependent variable (DV) into a metric one and then applied the indices needed to find the suitability assumptions. Subsequently, we performed a binary logistic regression analysis with an intro method, whereby the DV would be a non-suicidal self-injury or a re-attempt of a non-suicidal self-injury during 2016 and 2017, while the IVs would be the socio-demographic and previous co-morbid psychopathology conditions variables (it should be noted that only this method of analysis supports dichotomous dependent variables within regression models). We finally performed all of our statistical analysis by means of the SPSS software package (release 22.0). The level of significance required in our tests was set at p<0.05 or p<0.01.

Results

The results obtained from assuming the independence of errors through the Durwin-Watson test showed that the latter was met in all IVs used as criteria. The non-multicollinearity assumption was met too for all IVs, since the value obtained was below 5 (IVF = between .08 and 2.91). As for the results obtained from the ROA statistical efficiency score ($\chi^2$), they showed that there is a significant improvement in the prediction of the probability of occurrence of the dichotomous categories of the DV. Additionally, the Nagelkerke values indicated that the predictive model explains between 16.2% and 92.7% of the variance of the DV according to the included IVs. The power of the contrast fit of the model is high according to the Hosmer-Lemeshow statistics (.62 to .98), as can be seen in table 2. All the assumed criteria provided an adequate prediction of compliance with the baseline assumptions needed to apply a binary logistic regression analysis, as well as a strong guarantee of predictive power.

Through the analysis of the prediction of the IVs on the dichotomous DV (NSSI = a non-suicidal self-injury; RANSSI = a re-attempt of a non-suicidal self-injury), we could verify that some socio-demographic and previous co-morbid psychopathology conditions variables (it should be noted that only this method of analysis supports dichotomous dependent variables within regression models). We finally performed all of our statistical analysis by means of the SPSS software package (release 22.0). The level of significance required in our tests was set at p<0.05 or p<0.01.

Table 2: Assumptions of error independence, statistical efficiency of ROA, R2 Nagelkerke and power of contrast (Hosmer-Lemeshow) of independent variables (socio-demographic and previous co-morbid psychopathology conditions) (N= 176)

<table>
<thead>
<tr>
<th>Variable</th>
<th>D-W</th>
<th>VIF</th>
<th>$\chi^2$</th>
<th>-2Log(vero)</th>
<th>R2 Nagelkerke</th>
<th>H-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>2.13</td>
<td>.19</td>
<td>46.23**</td>
<td>9.53</td>
<td>.391</td>
<td>–</td>
</tr>
<tr>
<td>Age</td>
<td>1.19</td>
<td>1.22</td>
<td>9.56**</td>
<td>.32</td>
<td>.712</td>
<td>.76</td>
</tr>
<tr>
<td>Civil status</td>
<td>2.54</td>
<td>2.91</td>
<td>10.34**</td>
<td>.73</td>
<td>.691</td>
<td>.88</td>
</tr>
<tr>
<td>Academic or employment status</td>
<td>3.98</td>
<td>1.59</td>
<td>12.51**</td>
<td>.93</td>
<td>.162</td>
<td>.62</td>
</tr>
<tr>
<td>Previous pathology</td>
<td>6.16</td>
<td>.08</td>
<td>4.91**</td>
<td>.52</td>
<td>.785</td>
<td>.98</td>
</tr>
<tr>
<td>Triggering situation</td>
<td>5.31</td>
<td>.26</td>
<td>7.18**</td>
<td>.93</td>
<td>.816</td>
<td>.84</td>
</tr>
<tr>
<td>Single self-injury method</td>
<td>3.22</td>
<td>1.76</td>
<td>11.56**</td>
<td>.83</td>
<td>.927</td>
<td>.90</td>
</tr>
<tr>
<td>Health action after valuation</td>
<td>4.12</td>
<td>.78</td>
<td>9.59**</td>
<td>.69</td>
<td>.759</td>
<td>.73</td>
</tr>
</tbody>
</table>

Table 2: Assumptions of error independence, statistical efficiency of ROA, R2 Nagelkerke and power of contrast (Hosmer-Lemeshow) of independent variables (socio-demographic and previous co-morbid psychopathology conditions) (N= 176)

D-W = Durwin-Watson test; VIF = Variance inflation factor-VIF (multicollinearity statistic); $\chi^2$ = ROA statistical efficiency test; *p<0.05 ** p<0.01; ns = non-significant; -2Log(vero)= Logarithm of likelihood minus 2; R2 Nagelkerke = Variance explained by each IVs; H-S = Hosmer-Lemeshow test or power of contrast

Discussion

Our study was focused on evaluating the socio-demographic and previous co-morbid psychopathology conditions in adolescents and young adults who had suffered from self-inflicted lesions. It was aimed at determining which variables might predict a future self-inflicted lesion after 12 months, as well as assessing the healthcare received by patients in hospital emergency rooms after their body injuries were duly treated.

It is essential to focus on the origin of self-inflicted injuries to detect the most predictive variables of more serious suicidal behaviour, and an appropriate way is to use alternative informants, such as health professionals, which is in line with other research (Bjelazkovic, Groznica-Hrzelic, & Dodig-Curkovic, 2019; Garcia-Nieto et al., 2012). The results show that the most reliable predictors for repeated self-inflicted injuries in adolescents and young adults who have suffered previous injuries are age, gender, anxiety disorder and bullying. In recent years, bullying has caught the interest of researchers as a predictor of suicide (Hertz, Donato, & Wright, 2013; Holt et al., 2015). In this study, bullying has proved to be one of the strongest predictors of self-inflicted or non-suicidal injuries in adolescents and young people - indeed, it got, in line with some other previous studies (Hinduja & Patchin, 2019), an important predictive weight (O.R. = 7.76) in the repetition of self-injury after 12 months. In our opinion, campaigns should be implemented to detect bullying at an early stage, to raise awareness of the
seriousness of its consequences among school, high school and university communities, and to design fast and effective intervention protocols. We are aware that some suicide prevention programs for community populations need to be improved (Soto-Sanz et al., 2019). However, previous self-inflicted injuries in adolescents or young people are indirect requests for help that are modulated by the perception about the existence and adequate utility of a social support network, as has been raised by other authors (Sánchez-Teruel & Robles-Bello, 2014). School-based suicide prevention programmes in 12 European countries (Saving and Empowering Young Lives in Europe-SEYLE) (Wasserman et al., 2015) have shown that this influence acts as a catalyst for revealing suffering and, at the same time, can provide clues for teachers, parents, and peers to perceive the prior danger signs that an adolescent or young people show before a more serious injury or suicide attempt (Levi-Belz et al., 2019). Also, in previous research conducted across 47 low- and middle-income countries, time of exposure (over 20 days) to bullying was identified as a strong predictor of severity in adolescent suicide attempts (Koyanagi et al., 2019). Therefore, suicide prevention programmes targeting community populations are possible and reduce risk factors by making an existing problem visible in schools. But also, it is essential to implement specific components aimed at specific populations that suffer from bullying situations with agile response protocols, and that are perceived as appropriate and useful by their addressees. A few basic educational actions can save lives.

On the other hand, we strongly believe that there is an urgent need to design and implement specific healthcare protocols for suicide prevention in this clinical sub-population that (i) help health professionals conduct ongoing assessments by using direct questions about suicidal intent, and (ii) allow the quick detection of any other factors associated with an increased risk of suicide. Those protocols could be useful to determine a profile of the population at risk, as advocated in this study. We have identified such risk factors for self-injury as being a female (O.R. = 6.22), in line with most previous studies (Bježančević, Grznica-Hržić, & Dodig-Curković, 2019; Brown & Plener, 2017; Cano-Montalbán & Quevedo-Blasco, 2018). However, in this study, the most predictive age was 21–22 years (OR = 4.71), as in another European study on Swedish adolescents (Beckman, 2019). However, there are age differences in French youths (Fedorowicz & Fombonne, 2007). The age difference as a factor of greatest suicidal vulnerability in adolescents and young adults who have made previous suicide attempts or self-inflicted injuries might be determined by the tremendous modulation of cultural conditioners, as some studies have suggested (López-Castromón et al., 2015), because of differences in the vital challenges they are exposed to according to age (Horváth et al., 2018). Therefore, context and geography are key to understanding and improving the mental health of those groups, so any local knowledge about self-inflicted injuries might be key to better adapting such community-based prevention. Also, intervention programmes should be aware of the heterogeneity in age-specific adverse events, because this demographic variable seems to imply a differentiated modulation on suicidal severity.

It should not go unnoticed that anxiety disorders in adolescents and young adults that are associated with self-inflicted injuries might be a clear indicator of an increased likelihood of future more serious injuries or subsequent suicide attempts in line with other studies (Mars, 2019; Wasserman et al., 2015). This should be well taken into consideration by doctors when their youth patients repeatedly visit hospital emergency rooms and report anxiety-related problems (Greger, 2019). In fact, according to the results of our study, an anxiety disorder is a major predictor (O.R. = 6.12) of repeated self-inflicted injuries in those adolescents and young adults who had shown this behaviour in the 12 months following the first injury; this is especially serious because in these cases the injuries are indicative of an already activated capacity for suicide. More than half of the people who attempt suicide die on the first attempt (Jordan & McNiel, 2019). The notion that there is a need for a comprehensive approach to suicide from a broad, multidisciplinary perspective (including hospital emergency care provided by mental health professionals) can hardly be challenged. Additionally, the need to monitor, in the short term, any suicidal behaviour among high-risk adolescents has become an urgent measure.

Regarding suicide prevention, there is a tremendous difference between the health systems of the Member States of the European Union. However, some countries have taken specific health actions that have reduced suicide death rates by almost 41% (Sadeniemi et al., 2018). In our study we showed that adolescents and young adults who self-injure are, after getting treated of body wounds, promptly discharged from hospital emergency rooms (O.R. = 4.53) without being offered any specific mental health care, let alone a follow-up

| Gender (female) | .39 | .11 | 3.71* | 6.22 | 6.03 | 7.11 |
| Age (19-20 years) | .21 | .01 | 3.18* | 2.19 | 2.09 | 4.98 |
| Age (21-22 years) | .75 | .24 | 4.52** | 4.71 | 4.29 | 5.73 |
| Academy or employment status (studying) | .72 | .03 | 6.36** | 2.99 | 1.58 | 6.01 |
| Previous pathology (anxiety disorders) | .81 | .27 | 3.99** | 6.12 | 5.43 | 7.21 |
| Triggering situation (bullying) | .98 | .04 | 6.58** | 7.76 | 5.69 | 8.89 |
| Single self-injury method (cutting) | .43 | .11 | 8.82* | 2.18 | 1.62 | 2.45 |
| Health action after valuation (discharge) | .69 | .19 | 7.34** | 4.53 | 4.11 | 5.23 |

β = beta coefficient; SE = Standard error; Wald = contrast power statistic; p = significance level; *p<.05 ** p<.01; ns = non-significant; O.R. = Odds Ratio or result of the regression-Exp. equation (β); CI = Confidence Interval; LL = Lower limit; UL = Upper Limit
treatment. We have also found that those individuals with a history of self-harm make up a well-defined group of high risk of suicide and need immediate treatment after each episode. Additionally, we support the idea, already outlined in some works (e.g. Christiansen & Jensen, 2007), that all such emergency services as may be in contact with those individuals prone to having a suicidal behavior need to count on a reliable onsite action plan to ensure that they receive the best possible treatment immediately after every attempt at their self-inflicting an injury. In this paper we provide enough evidence of the urgent need to develop specific health protocols so as to prevent adolescents and young adults from being re-exposed to future self-inflicted injuries, since self-harm behaviors may become gateways for suicide attempts or completed suicide. Self-inflicted injuries are indeed warnings that may be understood as alerts of a potentially greater lethality. Suicide prevention protocols should be adapted to the psycho-social characteristics of each risk group, and specialized public health warning actions for adolescents and young adults with a profile associated with a high risk of 245-254. An example of such a health action is that the state co-finances private psychotherapy, which is more agile and quicker, or that it includes a decent number of psychologists in the public health system, both in primary and specialised care, which could, in the short term, save lives.

Our work had but two principal constraints. The first one was the data collection procedure we used (digital medical records). It has been suggested that authors should be cautious when including behaviour results obtained through this approach (López-Castroman et al., 2011). However, given that health or statistical records of self-inflicted or non-suicidal injuries are non-existent or poorly updated in adolescents and young adults in many countries across the world (WHO, 2018) and that the available data can provide an epidemiological approach to a clinical phenomenon (García-Nieto et al., 2012), we consider our methodology approach well-suited to the problem. Future studies on self-inflicted injuries should indeed use direct procedures of data collection. The second constraint was the highly territorially-biased context of the data obtained, a hard fact that makes it difficult for us to generalize the results obtained. It is undeniable that cultural factors, among others, have a strong influence on the analysis of some key risk variables in suicide prevention, as some works have noted (Boyd et al., 2015). But it was precisely this aspect that invited more in-depth analyses of risk behaviour modulated by specific geographical contexts (WHO, 2018). The results obtained could lead to implementing local public policies of prevention (adjusted to specific countries and territories) of consummated suicide in target clinical subpopulations.

References


