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Cortisol and ACTH plasma levels in maternal filicides and violent psychiatric women

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ABSTRACT

Maternal filicide may be considered the result of significant interactions between increased individual vulnerability and overwhelming environmental stress. The present study examined whether the biological vulnerability to stress and psychotic depression in criminally insane filicidal women was associated with an imbalance of stress-related hormones. Early-morning plasma levels of hormones associated with depression and chronic stress, i.e., thyroid hormones, Cortisol and Adrenocorticotropic hormone (ACTH), were measured in 10 filicidal inpatients recovered in a high-security psychiatric hospital for the criminally insane and 10 matched psychiatric, non-filicidal, criminal mothers with comparable traumatic/abuse records. Filicidal mothers had higher than normative Cortisol levels and significantly higher ACTH levels than both the normative values and plasma levels of non-filicidal women. Levels of thyroid hormones fell within normal ranges, without between-groups differences. In addition, while psychiatric controls had the expected Cortisol–ACTH positive correlation, mothers who killed their children revealed no relationship between the two hormones. HPA in the group of filicide perpetrators was altered despite they had received antidepressant pharmacological treatment. The observed imbalance of hypothalamic-pituitary-adrenal (HPA) axis indicates a possible filicides' reduced sensitivity of the adrenal glands to ACTH, probably due to the pre-hospitalization long-term affective stress which preceded child homicide. The results reveal the existence of large psycho-biological stress-sensitivity in filicides, and careful post-discharge psychiatric follow-up of such women is recommended.
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1. Introduction

Maternal filicide, i.e., the murder of a child by her/his mother, is one of the most puzzling issues in psychiatry. Several studies have advanced criminological, psychological or psychiatric hypotheses to identify the main personality traits of filicidal mothers and thus to understand the psychological antecedents of filicide (Lewis and Bunce, 2003; McKee and Shea, 1998; Resnick, 1969; Stanton et al., 2000). Limited attention has been directed to the psycho-biological aspects of filicide, such as the possible interactions of environmental stress and individual vulnerability to adverse events. Clear examples of biological vulnerability are the delivery and post-partum periods, two conditions which may potentially cause changes in mental state as a consequence of the typical burst of hormone levels, triggering of the hypothalamic-pituitary-ovarian axis cascade, and altered neurotransmitter functioning in the central nervous system (Harris, 1994; Hendrick et al., 1998). Abrupt changes in post-partum hormone levels may significantly contribute to depressive mood changes in women, with increased vulnerability to the destabilizing effects of sex steroids (Bloch et al., 2000). After delivery, the thyroid system is also altered: significant thyroid dysfunctions are frequent – (post-partum) thyroiditis is the most common endocrinological disorder in the 6 months after delivery (Harris, 1989) – and the comorbidity between post-partum depression and thyroid dysfunction is high. In addition, the birth of a child may itself represent a critical stressful event which, in women at increased risk, may bring on a depressive episode. There are of course several psychosocial stressors which actively interact in precipitating the depressive mood, e.g., lack of family support, existence of family conflicts, unemployment, undesired pregnancies, etc. Typically, the human body responds to these factors with temporary or chronic alterations of the hypothalamic-pituitary-adrenal (HPA) axis, which leads to plasma release of corticosteroids (Dedovic et al., 2009; Singh et al., 1999).

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According to Stanton and Simpson (2002), the extreme behavior of filicidal mothers is the result of significant interactions between increased individual vulnerability and overwhelming environmental stress. Thus, this imbalance may collapse in a very vulnerable context such as the post-partum period, in which the most dramatic consequence could lead to the development of a depressive murderous syndrome. Within this framework, Cortisol and Adrenocorticotropic hormone (ACTH) are important biological markers sensitive to chronic stress and depression (Dedovic et al., 2009; Holsboer, 2000; Pariante et al., 2004; Vreeburg et al., 2009) and may be able to detect those women with the highest vulnerability to mental illness, even in the case of relatively long time lags after the conditions provoking the crime itself.

The present study analyzed the plasma levels of stress-related hormones (i.e., Cortisol and ACTH) in criminally insane filicidal women to ascertain whether this particular psychiatric sample shows greater biological vulnerability to stress and psychotic depression. In addition, following the suggestion of Hatters Friedman et al. (2005) we matched psychiatric filicidal mothers with mentally ill, violent, non-filicidal mothers with comparable demographic and biographical characteristics. This control group allowed us to compare the experimental sample with women suffering from a similar unfavorable social and stressful environment and with personal experience of enacted violence (a condition in itself representing an important psychological stressor). We expected to find higher levels of Cortisol and ACHT in filicidal than in non-filicidal patients. In addition, the use of normative hormone levels from healthy women allowed to compare the two psychiatric groups with the equivalent of a large sample of non-psychiatric women.

2. Methods

2.1. Participants

Twenty criminal inpatients were recruited from the *Ospedale Psichiatrico Giudiziario* [*High-security Psychiatric Hospital for the Criminally Insane*] of Castiglione delle Stiviere (Mantova, Italy) according to the following criteria: all patients had been convicted of criminal offenses but were judged to be mentally insane,[1] they had all already had one or more children, and were all in a chronic state (i.e., all patients showed a long-term clinical evolution, ranging several years, characterized by a difficult and problematic recovery). The psychiatrists who treated patients explained them the whole experimental procedure and ensured their mental competence in understanding and giving their written informed consent to participate in the research. The study was approved by the local Ethics Committee of the High-security Psychiatric Hospital for the Criminally Insane (Castiglione delle Stiviere, Mantova, Italy) and carried out in accordance with the ethical standards laid down in the Declaration of Helsinki.

The filicide group consisted of 10 women (mean age ± SD: 34.3 ± 7.0 years, range: 24–42 years; mean years of education ± SD: 10.0 ± 2.6 years), nine of whom had been convicted for child-killing and one for attempted child-killing. The average time lag between filicides' crime and blood sample collection was 46.6 months. Psychiatric diagnoses were ascertained by the ward psychiatrists by the Structured Clinical Interview for DSM Disorders (SCID).

Psychiatric assessments classified, at the time of the experiment, three patients as affected by Major Depression with psychotic symptoms (ICD-10 F33.3/F33.4), two Dysthymia (ICD-10 F34.1), one Schizoaffective disorder (ICD-10 F25.0), one Paranoid Schizophrenia (ICD-10 F20.0) and three Personality disorders, Schizotypal (ICD-10 F21.0), Paranoid (ICD-10 F60.0) and Borderline/Narcissistic type (ICD-10 F60.31/F60.8). Nearly all patients were treated with benzodiazepines (9 out of 10) and about half with antidepressant drugs (6 out of 10).

The control group consisted of 10 psychiatrically disturbed mothers, matched for age (mean ± SD: 37.8 ± 4.7 years, range: 30–43 years; $t(18) = 1.35$, *ns*) and educational level (mean ± SD: 12.0 ± 2.1 years; $t(18) = 1.90$, *ns*) to the filicide group. All patients were convicted of personal offenses (e.g., murder, attempted murder, physical assault, arson; eight patients) or robbery (two patients). At the time of the experiment, three patients were classified as suffering from Schizoaffective disorder (ICD-10 F25.0), one Bipolar affective disorder (ICD-10 F31.90), one Acute schizophrenia-like psychotic disorder (ICD-10 F23.20), and five Personality disorders, four with Borderline type (ICD-10 F60.31) and one with Antisocial type (ICD-10 F60.20). Like the filicide group, nine out of 10 patients were treated with benzodiazepines but, unlike that group, the psychiatric controls had more antipsychotic (nine patients) and mood-stabilizing (five) treatments.

Concerning stressful, traumatic and mourning events characterizing patients' life, the two groups had a particularly high frequency of episodes with significant psychological impact (see Table 1 for details).

2.2. Victims of filicide

Nine out of 11 victims who died were boys, the youngest baby being less than 1 h old and the oldest 7 years. Five victims were firstborns (two were 5 months old, one 6 months old, and two 3.5 and 4 years old); two were the second children of the family (less than 1 h and 7 years old). The remaining two pairs of children (two brothers of 24 months and 4 years, and two brothers 5 and 7 years old) were killed together. Only one boy of 6 months survived attack.

2.3. Determination of blood Cortisol and ACTH levels

In the high-security psychiatric unit where they were hospitalized, all patients get up at 7AM; participants' blood samples were

Table 1
Number of relevant life stressors which include three main clusters (in italic bold): death in family, traumatic familiar events (three subcategories, in italic) and personal traumatic or relevant events (six subcategories, in italic) in filicidal and non-filicidal psychiatric patients (second and third column, respectively). The sum of events in each cluster may surpass the number of subjects.

	Filicidal	Non-filicidal
Death in family	5	8
Traumatic events in family (total)	12	12
Alcoholic parents	3	4
Conflicts	7	5
Depressed parents	2	3
Personal traumatic or relevant events (total)	12	16
Attempted suicide	4	2
Self-mutilations	–	3
Complications in pregnancy	3	–
Substance abuse	2	7
Sexual abuse in childhood	2	2
Head trauma	1	2

[1] The article 2046 of the Italian Civil Code and the article 85 of the Italian Penal Code exclude the responsibility by reason of insanity on the premise that if there is no *mens rea* because of insanity, there is no criminal responsibility. However, the guilty verdict (i.e., the premeditated or unpremeditated attitude/behavior/criminal intent) is legally different from the responsibility (i.e., to be *non compos mentis*). In particular, the "guilty but mentally ill" verdict *de facto* allows to convict a person for his/her crime, but at the same time requires a psychiatric evaluation on his/her insanity with respect to the crime: when the psychiatric examination attests a mental disorder falling within those included in Axis I of the DSM-IV-TR, the defendant is confined in a *High-security Psychiatric Hospital for the Criminally Insane*.

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