Original Article

Medicolegal Aspects of Decomposition and Factors Affecting Its Occurrence in Qena and Luxor Governorates

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ABSTRACT

Decomposition problems have existed since the first autopsy and persist to this day. Decomposition depends on intrinsic and extrinsic factors; temperature is the most important one.Objective: To study the medicolegal aspects of decomposition and factors affecting its occurrence in Qena and Luxor governorates. Subjects and methods: A retrospective (from 1/1/2011 to 31/12/2015), in which the decomposed cases were collected and reviewed from autopsy files, and prospective (from 1/10/2016 to 31/3/2017) study conducted in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice.Results: The decomposed cases in the retrospective periods ranged from (13.5 %) in 2011 to (15.7 %) in 2015 and represented (14 %) in the prospective period. Males outnumbered females, where the ratio in the retrospective periods ranged from (8.25:1) in 2013 to (2.23:1) in 2014 and represented (5:1) in the prospective period. Most cases were in the 3rd, 4th decades and full terms. Incised injuries, pathological conditions, starvation and firearm injuries were the most common causes of death, while the highest percentages of undetermined deaths were (50 %) in the retrospective periods and (33.33 %) in the prospective period. The most common sites of death were homes in 2015 (60 %) and water in the prospective period (66.67 %). The fewer layers of clothes, the more accelerated decomposition. The highest percentages of cases were found in June, 2015 (31.4 %), and in March and October of the prospective period (27.8 %).

Keywords Medicolegal, Forensic Medicine, decomposition, Qena, Egypt

I. Introduction

Decomposition refers processes of degradation including the combined effects of putrefaction and autolysis (Forbes et al., 2005).

Putrefaction, which is the decomposition of organic matter by bacteria and fungi, is considered the main course of decomposition and can proceed until the cadaver becomes skeletalized, or it can substituted by mummification or adipocere formation (Stuart, 2003).

Decomposition follows several predictable sequential stages and the rate of decomposition may appear different due to multiple factors (HauTeo et al., 2013).

Problems due to decomposition, such as artifacts and alteration of postmortem tissues, have existed since the first autopsy and persist to this day (Byard and Butzbach, 2012).

Decomposition depends on intrinsic and extrinsic factors. Intrinsic factors include age, physical size of corpse, cause of death, and trauma, while extrinsic factors include temperature, coverings, animal predation and media (Madea, 2013). The effects of clothing on decomposition are based on its material and thickness. With increasing amount and layers of clothing, more time is required for maggots to reach the body (HauTeo et al., 2013).

The aim of this study is studying the factors affecting decomposition such as the age and

sex of the cadaver; temperature and coverings.

II. Subjects and methods

This study was conducted in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice, Egypt. It included the autopsies in which decomposition occurred and included a retrospective part and a prospective part. The retrospective part included the period from 1/1/2011 to 31/12/2015 and all cases of this period studied through manual review of all files of Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice. The prospective part included the period from 1/10/2016 to 31/3/2017 and involved the decomposed cases autopsied in this study. The following information was recorded and compared in both study parts: age; sex; seasonal variations, states of decomposition; and coverings. Decomposition was classified into states varied from local greenish discoloration to complete skeletalization. Also, processes substituted putrefaction such as mummification, adipocere formation and maceration were recorded. Ethical consideration was taken regarding the Ethical Review Committee of Assiut Faculty of Medicine.

Statistical analysis

The data were tested for normality using Anderson-Darling test and for homogeneity variances prior to further statistical analysis. Categorical variables were described by number and percent (N, %), where continuous variables described by mean and standard deviation (Mean, SD) (Yazici and Yolacan, 2007). Chi-square test and fisher exact testwere used to compare between categorical variables, while ANOVA t-test was used to compare between continuous variables. A two-tailed p <0.05 was considered statistically significant. Pearson and Spearman correlation was used for the association between variables. All analyses were performed with the IBM SPSS 20.0 software (Thadewald and Buning, 2007).

III. Results

In the retrospective period, the percentages of the decomposed cases represented (14.3 %); (169) cases from the total number of cases (1182) that ranged from (13.5 %) in 2011 to (15.7 %) in 2014, while the percentage of the decomposed cases represented (14 %) in the prospective period. There was no significant difference in the number of decomposed cases between the retrospective and the prospective periods (P-value 0.999) (Table 1).

Males outnumbered females; the ratio in the retrospective periods ranged from (2.23:1) in 2014 to (8.25:1) in 2013, while it was (5:1) in the prospective period. Also, there was neither significant difference in the number of males nor females through the retrospective and the prospective periods (Table 2).

The age groups that represented the highest percentages in the retrospective periods were the full terms and 3rd decade in females in 2011 and 2012 respectively (50 %) for each; the 3rd decade in females in 2015 (40 %); while the 3rd, 4th decades and full terms represented the highest percentages in females in the prospective period (33.3 %) for each. This is followed by the 4th decade in males in 2014 (31.03 %); the 3rd decade in males in 2011, 2012 and 2014 (29.41, 30.77 and 27.59 % respectively) and the 3rd decade in males in the prospective period (26.67 %). The cases of the 1st, 2nd, 5th, 6th, 7th, 8th and 9th decades ranged from (0 %) to (25 %) and the preterms ranged from (0 %) to (20 %). There were

significant differences related to the different age groups in 2012 and 2013 (P- value 0.038) for each and also in 2014 (P- value 0.004). There was no significant difference related to each age group in the retrospective and prospective periods (P- value ranged from 0.081 to 1) (Table 3).

As regards the distribution of the states of decomposition, the highest percentages of deaths were found in bloating and marbling in the retrospective periods (67.6 and 54.3 %) in 2013 and 2015 respectively, while in the prospective period the highest percentages were in discoloration and marbling (33.3 %) for each. The highest percentages of deaths found in active decay, maceration, adipocere formation, skeletalization and mummification were in the retrospective periods and represented (23.8, 9.5, 8.1, 2.9 and 2.7 %) respectively, while the highest percentage of deaths found in advanced decay was in the prospective period and represented (6 %). There were significant differences in the number of discoloration stage in the different periods (P- value 0.009) and a highly significant difference reported in the number of marbling stage in the different periods (P- value <0.001). There were highly significant differences in the different states of decomposition in 2012, 2013, 2014 and 2015 (P- value <0.001) for each (Table 4).

Regarding the effect of clothes on decomposition cases, it was found that the decomposed cases found in light clothes ranged from (19.1 %) to (20.7 %) in the retrospective period and (20 %) in the prospective period, those found in heavy one-layer clothes ranged from (6.25 %) to (10 %) in the retrospective period and (11 %) in the prospective period, while those found in heavy multilayer clothes ranged from (0 %) to (7.8 %) in the retrospective period and (6.3

%) in the prospective period. The decomposed cases found in hospital gowns ranged from (0 %) to (16.7 %) in the retrospective period and no such cases were found in the prospective period. All cases found in coffins, plastic bags and unclothed were decomposed and there were significant differences related to such coverings in 2014 (P- value 0.04) and the different coverings in the prospective period (P- value 0.012); in addition to highly significant differences related to light and heavy clothes in 2012, 2013, 2014, 2015 and the prospective period (P- value <0.001) and the different coverings in the retrospective periods (P- value <0.001) for each. (Table5).

In the present results when we study the effect of different coverings on decomposition in the view of the states of decomposition and PMI, we found that the fewest times needed for discoloration, marbling, bloating and active decay were with unclothed cases (0.25 ±0, 1.13 ±0.14, 2.42 ±0.49 and 7 ±0 days) respectively. With the other coverings, discoloration needed from 0.73 ±0.22 day in light clothes to 3.5 ±0 days in hospital gowns, marbling needed from 1.75 ±0 in coffins to 4.5 ± 0.71 days in hospital gowns, bloating needed from 3.24 ±0.71 in light to 9.22 ±2.64 days in heavy multilayer clothes and active decay needed from 10.4 ±2.17 in light to 20 ±0 days in heavy multilayer clothes. Advanced decay needed from 19 ±1.41 in light to 25 ±1.41 days in heavy one-layer clothes. Skeletalization and mummification needed 240 ±0 and 90 ±0 days respectively. The time needed for adipocere formation ranged from 90 ±0 days light to 100 ± 0 in heavy multilayer clothes. Maceration needed 3.6 ±0.89 days to appear with unclothed cases. There were highly significant differences related to the times of discoloration, bloating, active decay and

advanced decay in the different periods (P-value <0.001) for each (Table 6).

The highest percentage of the decomposed cases was in June, 2015 (31.4 %); while in the other periods, the highest percentages were in August, 2011 (23.8 %); March and July, 2012 (14.7 %); May and August, 2013 (16.2 %); July, 2014 (16.7 %); March and October of the prospective period (27.8 %). No decomposed cases were found in January or February of 2011; February, September or November of 2012; February or April of 2013; March or October of 2015 and December of the prospective period. There was a highly significant increase in the number of the decomposed cases in the hot months of the retrospective periods (P- value <0.001 for each) and no significant difference in the prospective period (P- value 0.539) (Figures 1 & 2).

Table (1): Number and percentages of the decomposed cases in relation to total autopsies in Qena Medicolegal Department (Qena and Luxor governorates) from 2011 to 2015 and from 1/10/2016 to 31/3/2017

Cases		2011	2012	2013	2014	2015	From 1/10/2016 To 31/3/2017	P-value
Total		156	246	267	268	245	128	
Fresh		135	212	230	226	210	110	
Decomposed	No.	21	34	37	42	35	18	
	%	13.5 %	13.8 %	13.9 %	15.7 %	14.3 %	14 %	0.999

P- value: non-significant = >0.05

Table (2): The distribution of the decomposed cases according to sex in Qena Medicolegal Department (Qena and Luxor governorates) from 2011 to 2015 and from 1/10/2016 to 31/3/2017

Sex	2011		2012		2013		2014		2015		From 1/10/2016 To 31/3/2017		P-value
	No.	Ratio	No.	ratio	No.	ratio	No.	ratio	No.	ratio	No.	ratio	
Male	17	4.25	26	3.25	33	8.25	29	2.23	30	6	15	5	0.056
Female	4	1	8	1	4	1	13	1	5	1	3	1	0.487
Total	21		34		37		42		35		18		

P- value: non-significant = >0.05

Table (3): The distribution of the decomposed cases according to age in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice from 2011 to 2015 and from 1/10/2016 to 31/3/2017

Age		2011 No. (%)	2012 No. (%)	2013 No. (%)	2014 No. (%)	2015 No. (%)	From 1/10/2016 To 31/3/2017 No. (%)	P-value
Preterm	Male	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	-
	Female	0(0%)	0(0%)	0(0%)	1(7.69%)	1(20%)	0(0%)	0.479
Full Term	Male	1(5.88%)	1(3.85%)	0(0%)	2(6.9%)	1(3.33%)	1(6.67%)	0.866
	Female	2(50%)	1(12.5%)	1(25%)	3(23.08%)	0(0%)	1(33.33%)	0.479
1st decade (1-10)	Male	0(0%)	2(7.69%)	1(3.03%)	0(0%)	0(0%)	0(0%)	-
	Female	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	-
2nd decade (11-20)	Male	3(17.65%)	2(7.69%)	4(12.12%)	2(6.9%)	1(3.33%)	1(6.67%)	0.540
	Female	1(25%)	0(0%)	0(0%)	2(15.38%)	0(0%)	0(0%)	0.479
3rd decade (21-30)	Male	5(29.41%)	8(30.77%)	7(21.21%)	8(27.59%)	3(10%)	4(26.67%)	0.081
	Female	1(25%)	4(50%)	1(25%)	2(15.38%)	2(40%)	1(33.33%)	0.223
4th decade (31-40)	Male	4(23.53%)	6(23.08%)	8(24.24%)	9(31.03%)	6(20%)	3(20%)	0.373
	Female	0(0%)	1(12.5%)	0(0%)	3(23.08%)	0(0%)	1(33.33%)	0.963
5th decade (41-50)	Male	0(0%)	6(23.08%)	6(18.18%)	5(17.24%)	5(16.67%)	3(20%)	0.287
	Female	0(0%)	1(12.5%)	0(0%)	1(7.69%)	0(0%)	0(0%)	0.666
6th decade (51-60)	Male	2(11.76%)	1(3.85%)	3(9.09%)	1(3.45%)	4(13.33%)	1(6.67%)	0.756
	Female	0(0%)	0(0%)	1(25%)	0(0%)	1(20%)	0(0%)	1.000
7th decade (61-70)	Male	1(5.88%)	0(0%)	1(3.03%)	1(3.45%)	2(6.67%)	0(0%)	0.955
	Female	0(0%)	1(12.5%)	1(25%)	0(0%)	0(0%)	0(0%)	-
8th decade (71-80)	Male	0(0%)	0(0%)	2(6.06%)	1(3.45%)	5(16.67%)	2(13.33%)	0.392
	Female	0(0%)	0(0%)	0(0%)	1(7.69%)	1(20%)	0(0%)	0.779
9th decade (81-90)	Male	1(5.88%)	0(0%)	1(3.03%)	0(0%)	3(10%)	0(0%)	1.000
	Female	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	-
P- value	*Male*	*0.575*	*0.038**	*0.038**	*0.004**	*0.144*	*0.657*	
	Female	*0.779*	*0.343*	*1.000*	*0.676*	*0.896*	*1.000*	
Total	Male	17(100%)	26(100%)	33(100%)	29(100%)	30(100%)	15(100%)	
	Female	4(100%)	8(100%)	4(100%)	13(100%)	5(100%)	3(100%)	

P- value: non-significant = >0.05

* P- value: significant = ≤0.05-0.01

Table (4): The distribution of the states of decomposition in the cases autopsied in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice from 2011 to 2015 and from 1/10/2016 to 31/3/2017

Decomposition States	2011 No.	%	2012 No.	%	2013 No.	%	2014 No.	%	2015 No.	%	From 1/10/2016 To 31/3/2017 No.	%	*P- value*
Discoloration	4	19.0	5	14.7	2	5.4	14	33.3	4	11.4	6	33.3	0.009*
Marbling	6	28.6	8	23.5	2	5.4	14	33.3	19	54.3	6	33.3	0.526
Bloating	3	14.3	13	38.2	25	67.6	11	26.2	6	17.1	1	5.6	<0.001**
Active Decay	5	23.8	5	14.7	4	10.8	1	2.4	2	5.7	3	16. 7	0.549
Advanced Decay	1	4.8	1	2.9	0	0.0	0	0.0	2	5.7	1	5. 6	0.896
Skeletalization	0	0.0	1	2.9	0	0.0	1	2.4	0	0.0	0	0	1
Mummification	0	0.0	0	0.0	1	2.7	0	0.0	0	0.0	0	0	-
Adipocere formation	0	0.0	1	2.9	3	8.1	0	0.0	0	0.0	1	5.6	0.449
Maceration	2	9.5	0	0.0	0	0.0	1	2.4	2	5.7	0	0	0.819
P- value	0.416		<0.001**		<0.001**		<0.001**		<0.001**		0.075		
Total	21	100	34	100	37	100	42	100	35	100	18	100	

P- value: non-significant = >0.05

** P- value: highly significant = <0.001

Table (5): The distribution of the different types of clothes found on the decomposed cases autopsied in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice from 2011 to 2015 and in the period from 1/10/2016 to 31/3/2017

Clothes	2011		2012		2013		2014		2015		From 1/10/2016 To 31/3/2017	
	Total	Decomposed No. (%)	Total	Decomposed No. (%)	Total	Decomposed No. (%)	Total	Decomposed No. (%)	Total	Decomposed No. (%)	Total	Decomposed No. (%)
Light	68	13(19.1 %)	94	19(20.2 %)	111	23(20.7 %)	110	22(20 %)	116	23(19.8 %)	5	1(20 %)
Heavy one-layer	60	4(6.7 %)	48	3(6.25 %)	80	7(8.8 %)	80	8(10 %)	52	4(7.7 %)	91	10(11 %)
Heavy Multilayer	15	0(0.0 %)	93	8(8.6 %)	70	4(5.7 %)	64	3(4.7 %)	67	3(4.5 %)	64	5(7.8 %)
Total	**143**		**235**		**261**		**254**		**235**		**160**	
P- value	*0.052*		*0.001**￼*		*<0.001**￼*		*<0.001**￼*		*<0.001**￼*		*<0.001**￼*	
Hospital gowns	10	1(10 %)	8	1(12.5 %)	0	0(0.0 %)	6	1(16.7 %)	5	0(0.0 %)	6	0(0.0 %)
Coffins	0	0(0.0 %)	1	1(100 %)	0	0(0.0 %)	1	1(100 %)	2	2(100 %)	0	0(0.0 %)
Plastic bags	1	1(100 %)	0	0(0.0 %)	0	0(0.0 %)	1	1(100 %)	1	1(100 %)	0	0(0.0 %)
Unclothed	2	2(100 %)	2	2(100 %)	3	3(100 %)	6	6(100 %)	2	2(100 %)	2	2(100 %)
Total	**13**		**11**		**6**		**14**		**10**		**8**	
P- value	0.779		0.779		-		**0.040***		0.819		-	
Total P- value	*<0.001**￼*		*<0.001**￼*		*<0.001**￼*		*<0.001**￼*		*<0.001**￼*		*0.012*￼*	

P- value: non-significant = >0.05;* P- value: significant = ≤0.05-0.01,   ** P- value: highly significant = <0.001

Table (6): The states of decomposition and PMI in the decomposed cases found with different coverings in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice from 2011 to 2015 and from 1/10/2016 to 31/3/2017

	PMI (days)							*P- value*
	Light	Heavy one-layer clothes	Heavy multilayer clothes	Coffins	Hospital gowns	Plastic bags	Unclothed	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	
Discoloration	0.73±0.22	1.53±0.22	2.03±0.21	-	3.5±0	0.88±0.18	0.25±0	*<0.001**￼*
Marbling	2.11±1.61	2.25±0.23	2.75±0.35	1.75±0	4.5±0.71		1.13±0.14	0.167
Bloating	3.24±0.71	5±0.82	9.22±2.64	6±0	-	4±0	2.42±0.49	*<0.001**￼*
Active Decay	10.4±2.17	13.38±1.69	20±0	-	-	-	7±0	*<0.001**￼*
Advanced Decay	19±1.41	25±1.41		21±0	-	-	-	*<0.001**￼*
Skeletalization	240±0	240±0	-	-	-	-	-	-
Mummification	90±0	-	-	-	-	-	-	-
Adipocere formation	90±0	-	100±0	-	-	-	-	0.098
Maceration	-	-	-	-	-	-	3.6±0.89	-

P- value: non-significant = >0.05   ** P- value: highly significant = <0.001
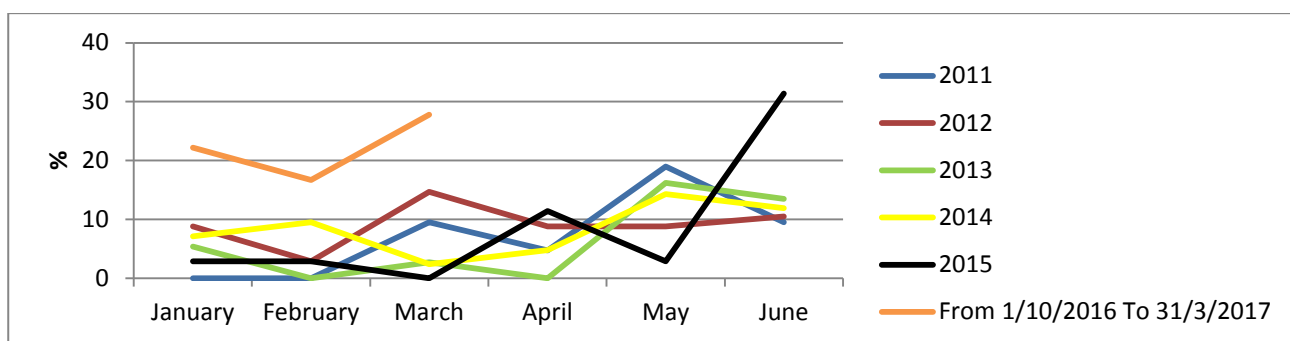
Figure (1): The percentages of the decomposed cases autopsied in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice from January to June of 2011 to 2015 and of 1/10/2016 to 31/3/2017
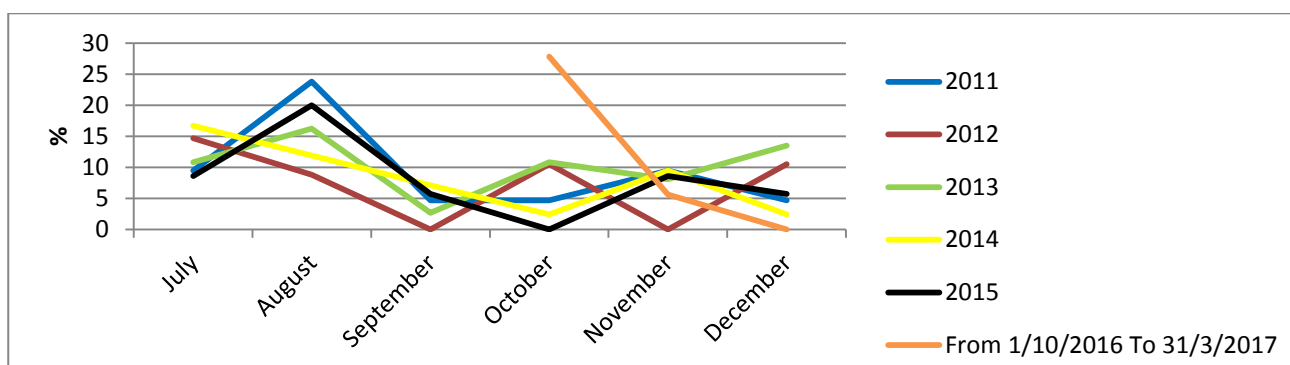

Figure (2): The percentages of the decomposed cases autopsied in Qena Medicolegal Department (Qena and Luxor governorates), Ministry of Justice from July to Decemberof 2011 to 2015 and of 1/10/2016 to 31/3/2017

IV. Discussion

Problems at autopsy due to decomposition have existed since the first autopsy and persist to this day (Byard and Butzbach, 2012).This study was conducted in Qena Medicolegal Department, Ministry of Justice that involves both Qena and Luxor governorates. It included a retrospective part from 1/1/2011 to 31/12/2015 and a prospective part from 1/10/2016 to 31/3/2017. Information was collected from autopsy files.

There were approximate percentages of the decomposed cases. In the retrospective period, the percentages of the decomposed cases represented (14.3 %); ranging from (13.5 %) in 2011 to (15.7 %) in 2014 and represented (14 %) in the prospective period. The approximate percentage may be attributed to the similarity of climate conditions, habits of population and police measurements. These observations were not in agreement with the study of Job (2007) in India that (7.8 %) of the cases autopsied showed decomposition due to the climatic changes.

Male cases outnumbered female ones in all periods, where male to female ratio ranged from (2:1) in 2014 to (8.25:1) in 2013 and (5:1) in the prospective period, this could be due to population habits of Upper Egypt where females spend most of their times at home, while males are the targets of revenge and the responsible of income and work. These observations are similar to the study of Job (2007) in India, where the ratio of males to females was (5.13:1) due to their culture where females spend most time in the houses, while males leave for employment.

The age groups that represented the highest percentages in the retrospective periods were the full terms and 3rd decade in females in 2011 and 2012. In the prospective period most cases were in the 3rd, 4th decades and full terms in females and the 3rd decade in males. The cases of 3rd and 4th decades in males are the targets of revenge and who leave their home in search of employment and the ages of fertility and family troubles in females. The increase of the full term cases may be attributed to family troubles, adultery, or unknown motives. The age groups (1st, 2nd, 5th, 6th, 7th, 8th and 9th) ranged from (0 %) to (25 %) and represented the deaths due to family troubles and pathological causes. The preterm deaths ranged from (0 %) to (20 %) and most of them were due to criminal abortion. Job (2007) observed in India that the age ranged from newborn to 92 years, the maximal incidence was in the age group of 31 to 50 years for the same reasons and the newborn females outnumbered males due to female feticide.

The highest percentages of deaths were found in the bloating and marbling states in the retrospective periods, while in the discoloration and marbling states in the prospective period. The highest percentages of deaths were found in active decay, maceration, adipocere formation, advanced decay, skeletalization and mummification. Most cases were found in relatively earlier states of decomposition as most deaths occurred in familiar places as homes. Cockle (1993) observed in Canada that the active decay and adipocere formation represented (2.5 and 4.5 %) respectively; Job (2007) in India observed discoloration, marbling and skeletalization in (22.7, 51.1 and 1.4 %) respectively; and Pope (2010) in USA observed bloating, advanced decay and mummification in (34.6, 14.8 and 6.2 %) respectively. Such variance could be attributed to the climatic changes.

Coverings found on the dead bodies in this study were confined to ordinary ones such as light cotton in hot months; one-layer and multilayer heavy clothes in cooler months; and

non-ordinary ones such as plastic bags, coffins and hospital gowns or even unclothed.

The highest percentages of the decomposed cases found in light, heavy one-layer and heavy multilayer clothes were (20.7, 10 and 8.6 %) respectively in the retrospective period and (20, 11 and 7.8 %) respectively in the prospective period. The highest percentage of the decomposed cases found in hospital gowns was (16.7 %). All unclothed cases and that found in coffins and plastic bags were decomposed. This shows that the direct effect of the sun and the fewer layers of clothes accelerate decomposition irrespective of the clothes materials. Galloway et al., (1989) found that the cotton clothes accelerated mummification and thus slowing decomposition. Cases in coffins or plastic bags found decomposed due to late dealing with such cases trapping heat and humidity in bags. Mann et al. (1990) observed that the effect of clothing on decomposition rates is less significant than climatic factors that agreed with this study. Dautartas (2009) found that the bodies in the tarps showed prolonged moist decomposition that agreed with this study. Voss et al., (2011) found that clothed pigs showed prolonged moist decomposition that look likesthe cases found in plastic bags in this study. Phalen (2013) found in USA that the bodies covered by fabrics showedadvanced stage in some body regions in the early summer that agrees with this study.

The times needed for discoloration, marbling, bloating and active decay were the fewest with the unclothed cases (0.25 ±0, 1.13 ±0.14, 2.42 ±0.49 and 7 ±0) respectively; followed by light clothes with discoloration, bloating and active decay (0.73 ±0.22, 3.24 ±0.71 and 10.4 ±2.17) respectively; and coffins in marbling (1.75 ±0) days. The most times were with hospital gown in discoloration and marbling (3.5 ±0 and 4.5 ±0.71) respectively;

and with heavy multilayer clothes in bloating and active decay (9.22 ±2.64 and 20 ±0) days respectively. Advanced decay needed from (19 ±1.41) in light to (25 ±1.41) days in heavy one-layer clothes. Skeletalization and mummification needed (240 ±0) and (90 ±0) respectively, while adipocere formation ranged from (90 ±0) in light to (100 ±0) days in heavy multilayer clothes. Maceration needed (3.6 ±0.89) days. This explains the fewer layers of clothes, the more accelerated decomposition and the early preservation of dead bodies in hospital gowns.

The highest percentage of the decomposed cases was in June, 2015 (31.4 %); while in the other periods, the highest percentages were in August, 2011 (23.8 %); March and July, 2012 (14.7 %); May and August, 2013 (16.2 %); July, 2014 (16.7 %); March and October of the prospective period (27.8 %). Most of the cases were in the hotter months that agreed with the studies showed the acceleration of decomposition in hot environments, and its deceleration in cold climates (Rodriguez and Bass, 1983; Mann et al., 1990; Bass, 1997; Clark et al., 1997; Galloway, 1997; Sledzik, 1998; Carter et al., 2008). In this study, bodies found to decompose more rapidly in the sunlight than those in the shade that disagreed with Goff (2000) who observed that the sun versus shade has no true effect on the overall rate of decomposition and agreed with Byrd and Castner (2001) who observed that the temperature is affected by the amount of sun.

In conclusion, there were approximate percentage of the decomposed cases in the different study periods, males outnumbered females in all periods, most cases were in the 3rd and 4th decades in addition to full terms, the most common causes of death were incised injuries, pathological conditions, starvation and firearm injuries, the highest percentage of the

undetermined cause of death was (50 %) and most deaths were found in homes and water. The fewer layers of clothes, the more accelerated decomposition and most of the decomposed cases were in the hot summer months.

V. Recommendations:

- As the temperature is the main factor affecting decomposition, information from the death scene, including ambient temperatures may be extremely useful and also incorporation of maximum, minimum and average temperature of each day.
- Combination of different variables in different times is necessary to increase the accuracy of PMI.

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الوجهة الطبية الشرعية للتحلل الرمي والعوامل المؤثرة على حدوثه بمحافظتي قنا والأقصر

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ظهرت مشاكل التحلل الرمي منذ بداية العهد بالتشريح ولا تزال مستمرة حتى يومنا هذا. تتأثر عملية التحلل بعوامل داخلية وخارجية أبرزها درجة الحرارة. وموضوع هذه الدراسة هو الوجهة الطبية الشرعية للتحلل الرمي والعوامل المؤثرة على حدوثه بمحافظتي قنا والأقصر. أجريت هذه الدراسة في قسم طب شرعي قنا التابع لوزارة العدل المصرية وتناولت دراسة مرجعية من ٢٠١١/١/١ إلى ٢٠١٥/١٢/٣١ ضمت الحالات المدونة بتقارير الطب الشرعي كما تناولت دراسة مستقبلية للمقارنة من ٢٠١٦/١٠/١ إلى ٢٠١٧/٣/٣١. تراوح عدد الحالات المتحللة في الفترات المرجعية بين (١٣.٥ ٪) في عام ٢٠١١ إلى (١٥.٧ ٪) في عام ٢٠١٥، أما في الفترة المستقبلية فبلغ عدد الحالات (١٤ ٪). ولقد فاق عدد الذكور عدد الإناث حيث تراوحت نسبة الذكور للإناث في الفترات المرجعية بين ٢.٢٣ : ١ في عام ٢٠١٤ إلى ٨.٢٥ : ١ في عام ٢٠١٣ وبلغت في الفترة المستقبلية ٥ : ١. كانت معظم الحالات في العقدين الثالث والرابع من العمر إضافة إلى حديثي الولادة مكتملي الأشهر الرحمية. كانت الإصابات الناتجة من الأسلحة الحادة والحالات المرضية والمجاعة والإصابات النارية هي أكثر أسباب الوفاة شيوعا، في حين لم يُتوصل لسبب الوفاة من (١١.٧٦٪) إلى (٥٠٪) في الفترات الرجعية ومن (٢٦.٦٧٪) إلى (٣٣.٣٣٪) في الفترة المستقبلية. أكثر الوفيات في الفترات المرجعية كانت في المنازل في عام ٢٠١٥ (٦٠٪) والمياه في الفترة المستقبلية (٦٦.٦٧٪). لوحظ أنه كلما قل عدد طبقات الملابس كلما زادت نسبة ودرجة التحلل الرمي. معظم الحالات كانت في الأشهر الأكثر حرارة: يونيو ٢٠١٥ (٣١.٤٪) ومارس وأكتوبر من الفترة المستقبلية (٢٧.٨٪).