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## Efficacy of Ayurvedic Anti- Hair fall Shampoo (Emami Kesh King Scalp and Hair medicine Anti Hairfall Shampoo) – Hair fall reduction

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### ABSTRACT

*Emami Kesh King Scalp and Hair Medicine Anti Hairfall Shampoo contains extracts of various herbs such as Amla, Ghritikumari, Lodhra, Haritaki etc. This present study attempts to support the claims made by the above-mentioned product for hair growth, hair fall reduction by 80% and protection from dandruff. Consenting adults (n=30) who were experiencing hair fall and dandruff issues were enrolled in a prospective open-label, phase 4 study. Each of them was provided 2 bottles of the product for the study (60 days) and asked to answer questions regarding product efficacy on a visual analogue scale. The scores were traced on days 0, 15, 30 and 60. Subjects observed an effective reduction in hair fall over 15 days and improvement in hair growth and dandruff signs over 60 days (p <0.001). Conclusion: Emami Kesh King Scalp and Hair Medicine Anti Hairfall Shampoo works effectively for hair fall and dandruff issues.*

**Keywords:** Kesh king, Anti Hair fall, Shampoo

### 1. INTRODUCTION

Hair is an integrated complex structure of several morphological components that act as a unit, it is divided into cuticle, cortex and medulla. The cuticle consists of flap overlapping scales (keratinocytes), the cortex is formed by elongated, fusiform cells connected by a cell membrane complex (CMC) which forms the mass of the hair. The medulla is present in coarser hair as thick hair and beard, weakness of the medulla causes splitting of hair.

Hair grows repeated 5-7 years of life cycles. It undergoes three phases: Anagen phase (growth phase), Catagen phase (transitional phase), Telogen phase (resting phase). In this modern age, many people experience hair problems such as Telogen effluvium (Hair thinning) which occurs due to hair thinning or shedding resulting from the early entry into the telogen phase (resting phase of the hair follicle). Dandruff causes flaking and mild itchiness of the scalp, seborrheic dermatitis which is the more severe form accompanied by inflammation of the scalp. Hair loss (alopecia) refers to a loss of hair from part of the head or body.

Hence to overcome these medical conditions and boost self-confidence, maintaining well-groomed hair using home use hair care products are the point of attraction for customers. Global market surveys point out that Asia-Pacific Hair Care Market is forecasted to touch USD 33.89 billion by 2024 (CAGR of 3.74%). Ayurvedic hair care products such as shampoo which is comprised of various internationally sourced herbs cleanse the hair and scalp and maintain its hygiene without ripping off the natural secretions that can leave the hair and scalp dry. Conditions like dandruff, hair fall etc can be attended by suitable incorporation of active herbs. The usage of shampoo prevent hair shaft damage and scalp issues, it also leaves the hair soft, shiny and manageable.

Emami kesh king scalp and hair medicine Anti Hairfall Shampoo contains various active herbal extracts. The majority of the formulation for each 10ml comprises of Amla extract (51.5mg), Ghritikumari extract (25.75mg), Lodhra extract (25.75mg), Haritaki extract (25.75mg), Bibhitika extract (25.75mg) along with extracts of Tulasi (15.45mg), Shikakai (10.3mg), Bhringaraja (10.3mg), Bhrami (10.3mg), Manjistha (10.3mg), Jatamansi (10.3mg), Badari (10.3mg), Henna (10.3mg), Nakesar (10.3mg), Nagarmotha (10.3mg), Fenugreek (10.3mg), Mandukprani (10.3mg), Goksura (10.3mg), Neem (11.3mg), Karanj (1.03mg), Lemon (0.01mg), Basil (0.01mg), Rosemary (0.01mg). the formulation also contains excipients such as DMDM hydantoin, methylisothiazoliene, brilliant blue FCF and Tartazine.

Kesh king scalp and hair medicine Anti Hairfall Shampoo claims to reduce hair fall up to 80%. This study is conducted to substantiate this claim.

## **2. MATERIALS AND METHODS**

### **Study design**

This was a prospective open-label phase 4 study that was carried out with Advanced Emami Kesh King Scalp And Hair Medicine Anti Hairfall Shampoo. 30 subjects all between the age of 18-60 years and those who were experiencing hair fall issues and/or dandruff issues were included after presenting them with informed consent in their mother tongue or English. Participants who had preexisting skin conditions such as psoriasis, eczema etc were not included in the study. The study was conducted ethically.

We conducted the study over two months (Dec 7th 2019 to Feb 7th 2020). During the study duration, each participant was given two bottles of Emami Kesh King Scalp And Hair Medicine Anti Hairfall Shampoo. The participant's feedback was recorded by the investigators through specifically curated questions. The responses were recorded on a visual analogue scale of 0-4 as 'poor' -0, 'fair' -1, 'good' -2, 'very good' -3, 'excellent' -4. The test parameters that were taken into consideration were: years of hair fall, years of dandruff and hair fall, hair population density, hair length, combing test- number and weight of hair strands fallen, dandruff parameters - itching, flaking, dryness and lesions The scores were noted on the day 0, 15, 30 and 60.

**Statistical methods:** A two-tailed student t-test was carried out to find the significance of the efficacy parameters of Emami Kesh King Scalp And Hair Medicine Anti Hairfall Shampoo

### **Results**

Table 1 and Table 2 shows the demographics of the subjects, it was observed that female subjects comprised the majority of the study population (70%) while the male subjects made up the rest (30%). In terms of age, the mean age among the female subjects were found to be 36.76 years, while in the male subjects it was 34.44 years. Overall the mean age of the sample population was 30.06 years.

With regard to existing hair conditions, 56.6% of subjects experienced hair fall and 43.4% of them experience hair fall with dandruff (Table 3). Regarding the number of years of the issues mentioned above, 41.18% of the subjects had hair fall issues for the past 1-2 years. 47.06% of the for the past 3-5 years and 11.76% for more than 5 years (Graph 1). While 46.15% of the subjects had been suffering from dandruff and hair fall for the past 1-2 years, 38.46% for the past 3-5 years and 5.38% of the subjects more than 5 years. (Graph 2)

### **Efficacy Parameter- Hair fall**

Table 4 portrayed the efficacy parameters of population /density and length. The score was kept to 0 to measure the improvement of the parameters. It was observed that a steady increase was seen with the mean score of the hair strand population, which was 0.9 on day 15, 1.83 on day 30 and 3.13 on day 60. While the mean scores of hair length were 1 on day 15, 1.9 on day 30 and 3.2 on day 60 (Graph 3). A two-tailed test for significance (Table 5) exhibited a significant difference between the results of day 0 and day 15 ( $p < 0.001$ ). A significant variation in values was also seen on the following day 30 and day 60.

Table 6 exhibits the responses given by the subject on the efficacy parameters population/density, on day 15, 83.33% of the subjects reported a "fair" improvement on average, while on day 30, 53% of the subjects reported "good" on an average. On day 60, 60% of the subjects scored "very good" while 26.67% scored "excellent" (Graph 4). With regards to increment in the length of the hair, 66.67% of the subjects reported "fair" on day 15, 53.33% of the subjects reported "good" on day 30 and 46.67% of the subjects reported, "very good" growth and 36.67% reported "excellent" on day 60 (Graph 5).

Table 7 and Graph 6 elicits the combing parameters which include the mean number of fallen hairs and the mean weight of the fallen hairs. On day 0 the mean number of fallen hairs was 161 strands and the mean weight was 182 mg. On day 15 it was 117 strands and 132mg while on day 30 it was 76 strands and 85mg. On day 60, the average number of strands was 31 and the average weight of the fallen hair strands was 35mg. Further, the test of significance was done on the same parameters to observe the significant decrease in hair fall during the combing test (Table 8). There was a significant difference between the values found on days 0, 15, 30, 60 ( $< 0.001$ ). The overall performance of the combing test portrayed a decrease of value from 100% to 19% (Table 9 and Graph 7).

The Anti-hair fall shampoo parameters analysed during a hair wash exhibited that on day 0 the mean number of fallen hair strands was 33 strands and the mean weight of the fallen hair strands was 38mg. While on day 15 the values were 24 strands and 26mg. On day 30 the mean number of hair strands was 16 and the mean weight of the fallen strands was 18, on the other hand on day 60 it was 8 hair strands and 9mg. (Table 10 and Graph 8). The t-Test of significance produced significant variation between days 0, 15, 30 and 60 ( $P < 0.001$ ) (Table 11). The overall performance of the shampoo test exhibited a decrease of value in the number of hair strands fallen from 100% to 24% of (Table 12 and Graph 9)

### **Efficacy parameter - Dandruff**

The dandruff efficacy parameters i.e., flaking, itching, dryness, and lesions were investigated from day 0 - 60. It was observed that the mean score of the parameters mentioned above on day 0 was 3.31, 3.08, 3.15 and 1.38 respectively which was significantly different from the scores observed on day 60 which was 0.38, 0.15, 0.15 and 0.08 respectively. (Table 13 and Graph 10).

T-test for significance as shown in Table 14 exhibits significant differences from day 0 throughout the study. ( $p < 0.001$ ). Table 15 portrays the visual analogue scores given by the subjects regarding dandruff efficacy parameters as a percentage distribution. In terms of flaking, 61.54% of the subjects scored "excellent" and 38.46% reported, "very good" scores on day 60 (Graph 11) while itching parameters were scored "very good" by 15.38% and "excellent" by 84.62% of the subjects on day 60 (Graph 12). On the dryness parameter, 84.62% of the subjects reported "excellent" scores and 15.38% reported "very good:" scores on day 60

(Graph13). Regarding the lesions parameter, 92.31% scored “excellent” while 7.69% was scored very good on day 60 (Graph 14). All these values were significant when compared to the score given on days 0, 15 and 30

Table 16 and Graph 15 presents the overall performance of the product regarding dandruff reduction efficacy, day zero was set at 100% to observe the improvement. Flaking was shown to reduce to 65.12% on day 15, 39.53% on day 30 and 11.63% on day 60. The itching was observed to be reduced to 70% on day 15, 47.50% on day 30 and 5% on day 60. While dryness and lesion were shown to reduce to 75.61 % on day 15, 46.34% on day 30, 4.88% on day 60 and 61.11 % on day 15, 33.33% on day 30 and 5.56% on day 60 respectively.

### 3. DISCUSSION

The efficacy of ayurvedic anti-hair fall shampoo was observed over 60 days in 30 subjects. The efficacy and performance of the product were analyzed from the visual analogue scores provided by the subjects on days 0, 15, 30 and 60. Considering the hair fall efficacy parameter i.e., the hair population/density and length were analyzed. The mean scores collected from the subjects showed a steady hike from day 0 to day 60 in terms of hair stand population and density. A T-test of significance exhibits that there was a significant increase in the hair population and density on day 15 itself when compared to day 0. The Emami Kesh King Scalp and Hair Medicine Anti Hairfall Shampoo continued to show positive results throughout the study which implies that it does improve hair growth.

This improvement was also evident in the visual analogue scores submitted by the subjects. On day 60, regarding the population and density of hair, 60% of subjects scored very well and 26.67% scored excellently. While in terms of hair length increment 46.67% of the subjects reported very good and 36.67% reported excellent results.

To substantiate the claim of hair fall reduction, a combing test was carried out, it was observed that there was an evident reduction in the mean number of hair strands and the mean weight of the fallen hair. The results regarding the combing parameters were also found to be significant ( $P < 0.001$ ). This shows a steady improvement in the reduction of hair fall throughout the study. There was also an overall reduction in hair fall from 100% to 19% on using the Emami Kesh King Scalp and Hair Medicine Anti Hairfall Shampoo.

The anti-hair fall parameters carried out during a hair wash, showed a steady decrease in the number of hair strands observed on using Emami Kesh King Scalp and Hair medicine Anti Hairfall Shampoo over the study period of 2 months The T-test for significance showed a significant improvement in hair fall on day 15 compared to day 0. This implies that the product of interest has worked effectively in reducing hair fall. The overall performance of the anti-hair fall shampoo depicted a steady decrease in hair fall from 100% on day 0 to 24 % on day 60

About the dandruff parameters, the efficacy of the parameters was observed by taking into consideration the symptoms and signs experienced during dandruff I.e flaking, itchininess, dryness and presence of lesions. The mean score showed an evident improvement over 60 days. The two-tailed t-test for significance also portrayed a significant improvement on day 15, day 30 and day 60 compared to day 0. This states that the signs of dandruff improved over 60 days on the usage of the product.

The visual analogue scale score provided by the subjects scored 61.54%, 84.62%, 84.62% and 92.31% of “excellent” scores for improvement in flaking, itching, dryness, and lesions respectively. The overall performance also exhibited a reduction from 100% on day 0 to 11.63% for flaking, 5% for itching, 4.88% for dryness and 5.56% for lesions on day 60. The evident improvement in the signs and symptoms of dandruff support the claim that the product of interest does help protect against seborrheic dermatitis and Pityriasis capitis simplex (dandruff).

### 4. CONCLUSION

For the study population, the above 60-day prospective open-label clinical trial findings for efficacy suggest that the product could control hair fall and dandruff and improve hair growth significantly for all study subjects. All the above complaints experienced by the study population irrespective of the severity were shown to be effectively relieved by the use of the product. There was excellent overall compliance to the treatment and no clinically significant adverse reactions. Hence it may be concluded that the Emami Kesh King Scalp and Hair Medicine Anti Hairfall Shampoo supports the claims of reducing hair fall in 15 days, improving dandruff, and hair growth

**Table 1: Age**

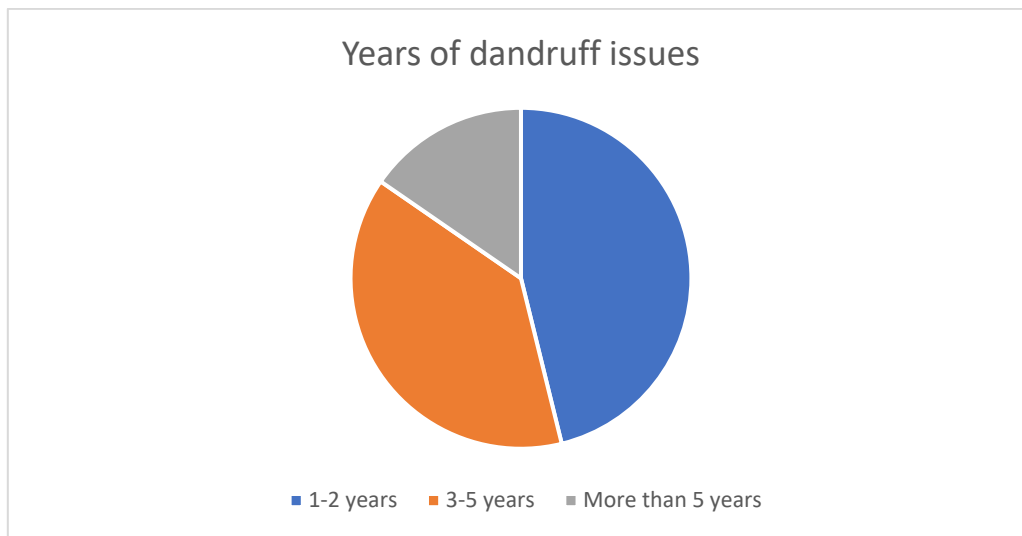
|        | N  | Mean  |
|--------|----|-------|
| female | 21 | 36.76 |
| male   | 9  | 34.44 |
| total  | 30 | 36.06 |

**Table 2: Gender**

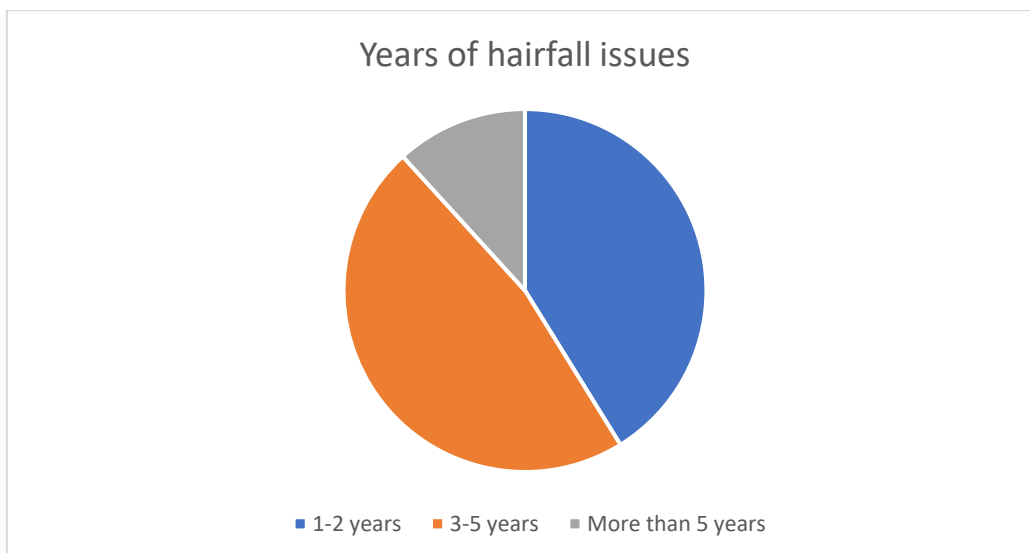
|        | N  | %   |
|--------|----|-----|
| female | 21 | 70  |
| male   | 9  | 30  |
| total  | 30 | 100 |

**Table 3: Existing hair and scalp issues**

| Problems                  | N  | %      |
|---------------------------|----|--------|
| Hair fall                 | 17 | 56.60  |
| Dandruff and hair fall    | 13 | 43.40  |
| Years of dandruff issues  |    |        |
| 1-2 years                 | 6  | 46.15  |
| 3-5 years                 | 5  | 38.46  |
| More than 5 years         | 2  | 15.38  |
| Total                     | 13 | 100.00 |
| Years of hair fall issues |    |        |
| 1-2 years                 | 7  | 41.18  |
| 3-5 years                 | 8  | 47.06  |
| More than 5 years         | 2  | 11.76  |
| Total                     | 17 | 100.00 |



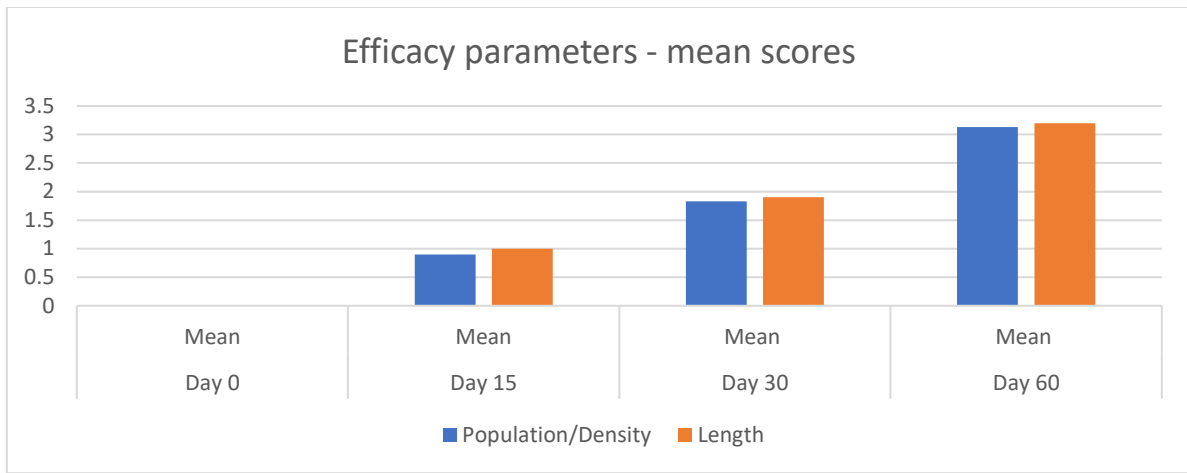
**Graph 1: Years Of Dandruff Issues**



**Graph 2: Years Of Hairfall Issues**

**Table 4: Efficacy Parameters- Mean Scores**

| Efficacy           | Day 0 |    | Day 15 |      | Day 30 |      | Day 60 |      |
|--------------------|-------|----|--------|------|--------|------|--------|------|
|                    | Mean  | SD | Mean   | SD   | Mean   | SD   | Mean   | SD   |
| Population/Density | 0     | 0  | 0.9    | 0.4  | 1.83   | 0.69 | 3.13   | 0.63 |
| Length             | 0     | 0  | 1      | 0.59 | 1.9    | 0.72 | 3.2    | 0.71 |



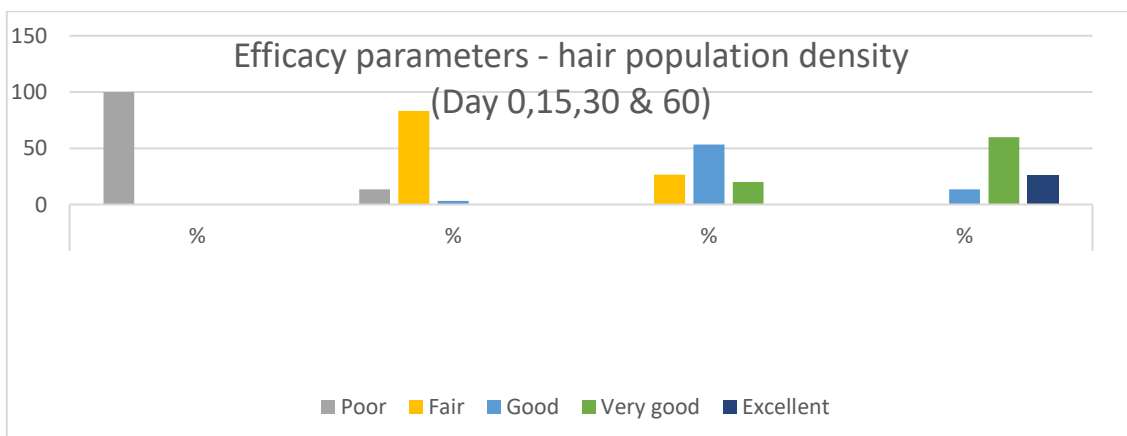
Graph 3: Efficacy Parameters – Mean Scores

Table 5: Efficacy parameters- test for significance

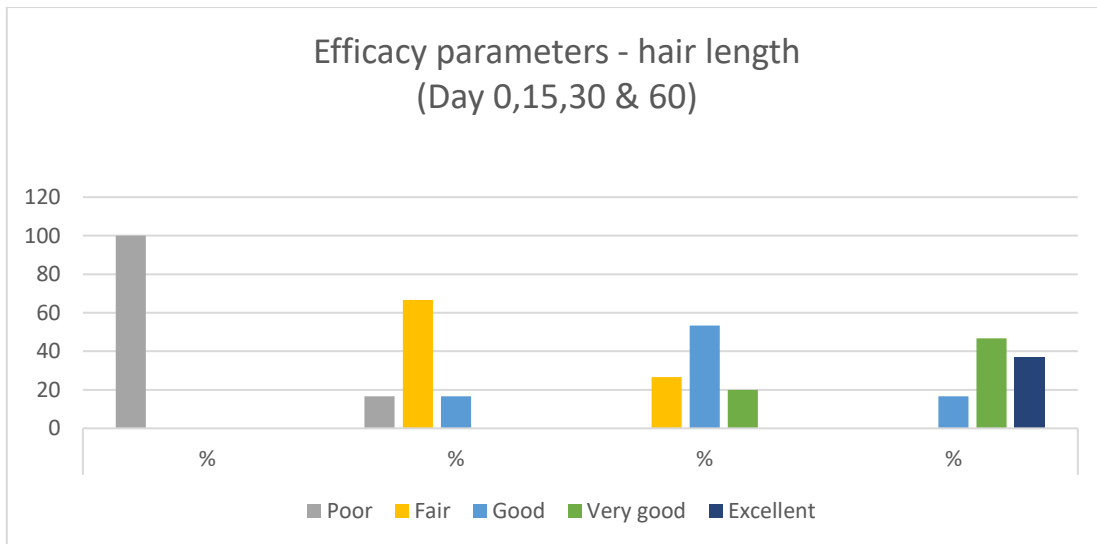
| Efficacy     | Population/Density |         | Length  |         |
|--------------|--------------------|---------|---------|---------|
|              | T value            | Sig     | T value | Sig     |
| Day 0 vs 15  | 5.538              | p<0.001 | 3.126   | p<0.001 |
| Day 0 vs 30  | 1.967              | p<0.001 | 6.534   | p<0.001 |
| Day 0 vs 60  | 3.116              | p<0.001 | 6.045   | p<0.001 |
| Day 15 vs 30 | 4.188              | p<0.001 | 5.988   | p<0.001 |
| Day 15 vs 60 | 3.087              | p<0.001 | 1.569   | p<0.001 |
| Day 30 vs 60 | 4.22               | p<0.001 | 8.394   | p<0.001 |

Table 6: Efficacy parameters- percentage distribution

| Efficacy                  | Day 0 |     | Day 15 |       | Day 30 |       | Day 60 |       |
|---------------------------|-------|-----|--------|-------|--------|-------|--------|-------|
|                           | N     | %   | N      | %     | N      | %     | N      | %     |
| <b>Population/Density</b> |       |     |        |       |        |       |        |       |
| Poor                      | 30    | 100 | 4      | 13.33 | 0      | 0     | 0      | 0     |
| Fair                      | 0     | 0   | 25     | 83.33 | 8      | 26.67 | 0      | 0     |
| Good                      | 0     | 0   | 1      | 3.33  | 16     | 53.33 | 4.00   | 13.33 |
| Very good                 | 0     | 0   | 0      | 0     | 6      | 20.00 | 18.00  | 60.00 |
| Excellent                 | 0     | 0   | 0      | 0     | 0      | 0     | 8.00   | 26.67 |
| <b>Length</b>             | 30    |     |        |       |        |       |        |       |
| Poor                      | 0     | 100 | 5      | 16.67 | 0      | 0     | 0      | 0     |
| Fair                      | 0     | 0   | 20     | 66.67 | 8      | 26.67 | 0      | 0     |
| Good                      | 0     | 0   | 5      | 16.67 | 16     | 53.33 | 5      | 16.67 |
| Very good                 | 0     | 0   | 0      | 0     | 6      | 20.00 | 14     | 46.67 |
| Excellent                 | 0     | 0   | 0      | 0     | 0      | 0     | 11     | 36.67 |



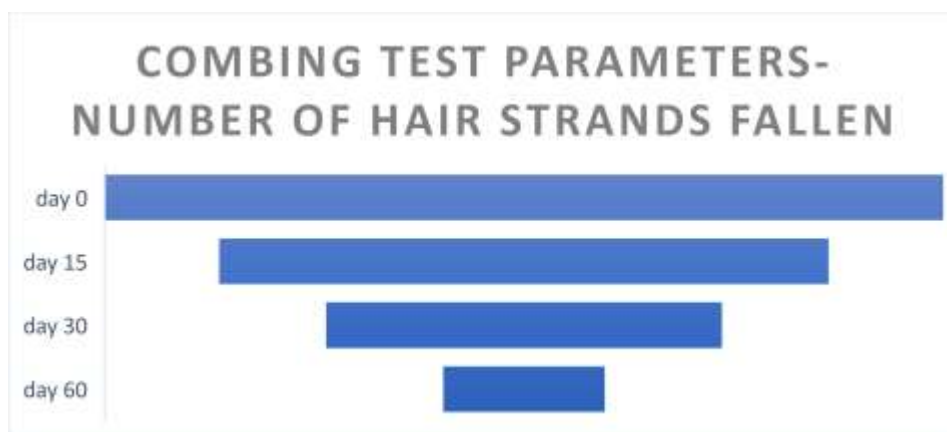
Graph 4: Efficacy Parameters – Hair Population Density



Graph 5: Efficacy Parameters – Hair Length

Table 7: Combing test parameters

|        | number of hair strands fallen (mean) | weight of fallen hair strands in mg (mean) |
|--------|--------------------------------------|--|
| day 0  | 161                                  | 182  |
| day 15 | 117                                  | 132  |
| day 30 | 76                                   | 85   |
| day 60 | 31                                   | 35   |



Graph 6: Combing Test Parameters – Number Of Strands Fallen

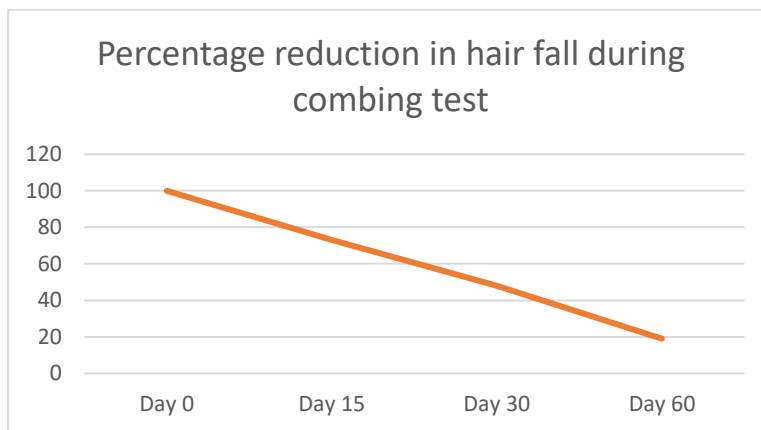
Table 8: Combing Parameters - Test For Significance

| Efficacy     | No. of hair strands fallen |         | Weight of hair strands fallen |         |
|--------------|----------------------------|---------|-------------------------------|---------|
|              | T value                    | Sig     | T value                       | Sig     |
| Day 0 vs 15  | 2.04                       | p<0.001 | 2.197                         | p<0.001 |
| Day 0 vs 30  | 9.719                      | p<0.001 | 2.505                         | p<0.001 |
| Day 0 vs 60  | 3.054                      | p<0.001 | 1.518                         | p<0.001 |
| Day 15 vs 30 | 2.739                      | p<0.001 | 3.788                         | p<0.001 |
| Day 15 vs 60 | 2.402                      | p<0.001 | 6.104                         | p<0.001 |
| Day 30 vs 60 | 6.037                      | p<0.001 | 4.694                         | p<0.001 |

Table 9: Number Of Hair Strands Fallen Percentage Reduction

|       | Percentage | Mean |
|-------|------------|------|
| Day 0 | 100        | 161  |

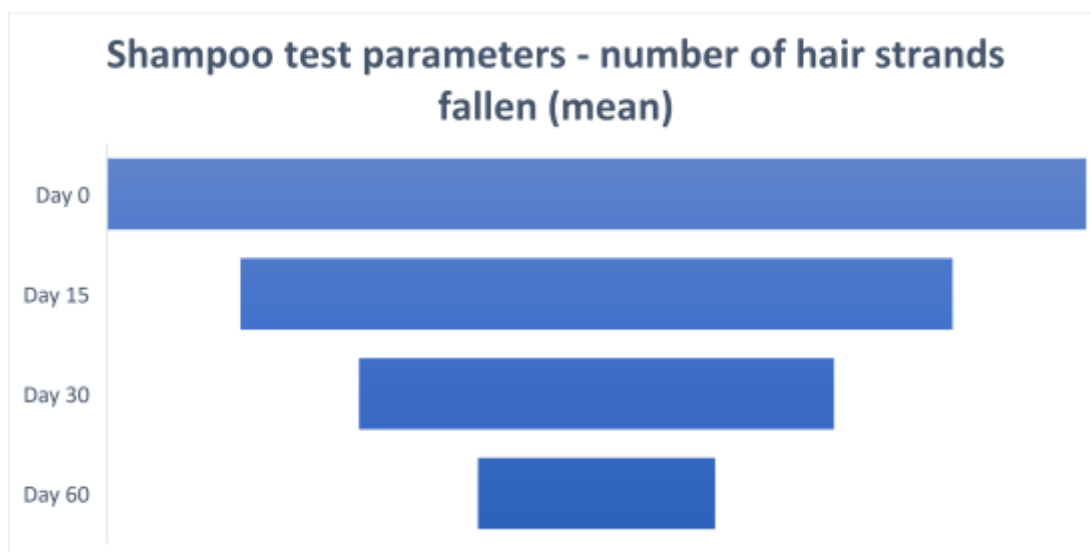
|        |    |       |
|--------|----|-------|
| Day 15 | 73 | 116.7 |
| Day 30 | 48 | 76    |
| Day 60 | 19 | 31    |



**Graph 7: Percentage Reduction In Hairfall During Combing Test**

**TABLE 10: Emami Kesh King Scalp And Hair Medicine Anti Hairfall Shampoo Test parameters :**

|        | Number of hair strands fallen (mean) | Weight of fallen hair strands in mg (mean) |
|--------|--------------------------------------|--|
| Day 0  | 33                                   | 38   |
| Day 15 | 24                                   | 26   |
| Day 30 | 16                                   | 18   |
| Day 60 | 8                                    | 9  |



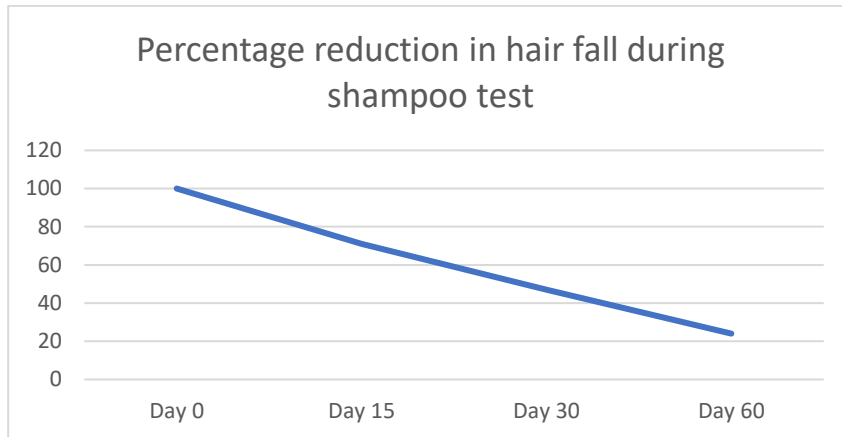
**Graph 8: Shampp Test Parameters – Number Of Hair Strands Fallen (Mean)**

**Table 11: shampoo test - t-test for significance**

|              | Number of hair strands fallen |         | Weight of hair strands fallen (mg) |         |
|--------------|-------------------------------|---------|------------------------------------|---------|
|              | T value                       | Sig     | T value                            | Sig     |
| Day 0 vs 15  | 8.368                         | p<0.001 | 6.132                              | p<0.001 |
| Day 0 vs 30  | 6.352                         | p<0.001 | 8.53                               | p<0.001 |
| Day 0 vs 60  | 2.962                         | p<0.001 | 3.183                              | p<0.001 |
| Day 15 vs 30 | 2.159                         | p<0.001 | 5.442                              | p<0.001 |
| Day 15 vs 60 | 1.024                         | p<0.001 | 6.261                              | p<0.001 |
| Day 30 vs 60 | 2.26                          | p<0.001 | 1.194                              | p<0.001 |

**Table 12: Number Of Hair Strands Fallen Percentage Reduction**

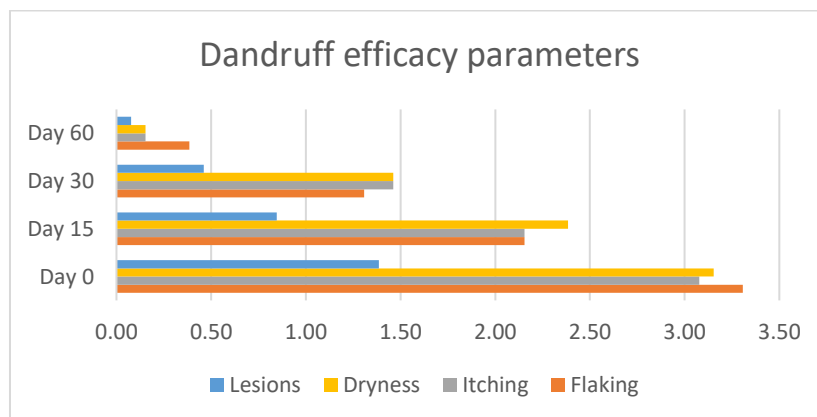
| Day    | Percentage | Mean |
|--------|------------|------|
| Day 0  | 100        | 33   |
| Day 15 | 71         | 24   |
| Day 30 | 47         | 16   |
| Day 60 | 24         | 8    |



**Graph 9: Percentage Reduction In Hair Fall During Shampoo Test**

**Table 13: Efficacy parameters on dandruff – mean scores**

| Criteria | Day 0 | Day 15 | Day 30 | Day 60 |
|----------|-------|--------|--------|--------|
| Flaking  | 3.31  | 2.15   | 1.31   | 0.38   |
| Itching  | 3.08  | 2.15   | 1.46   | 0.15   |
| Dryness  | 3.15  | 2.38   | 1.46   | 0.15   |
| Lesions  | 1.38  | 0.85   | 0.46   | 0.08   |



**Graph 10: Dandruff Efficacy Parameters**

**Table 14: Dandruff parameters - t-test for significance**

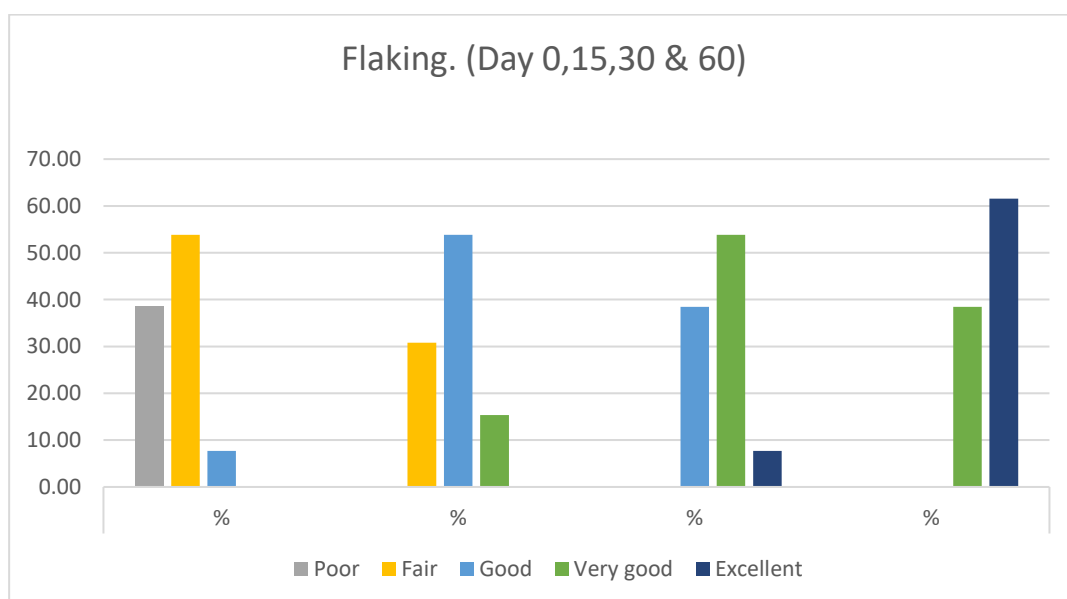
| Efficacy    | Flaking |         | Itching |         | Dryness |         | Lesions |         |
|-------------|---------|---------|---------|---------|---------|---------|---------|---------|
|             | T value | Sig     | T value | Sig     | T value | Sig     | T value | Sig     |
| Day 0 vs 15 | 7.233   | p<0.001 | 4.835   | p<0.001 | 5.809   | p<0.001 | 2.813   | p<0.01  |
| Day 0 vs 30 | 3.092   | p<0.001 | 7.742   | p<0.001 | 5.09    | p<0.001 | 8.935   | p<0.001 |
| Day 0 vs 60 | 9.441   | p<0.001 | 9.441   | p<0.001 | 3.105   | p<0.001 | 6.426   | p<0.001 |



|              |       |         |       |         |       |         |       |        |
|--------------|-------|---------|-------|---------|-------|---------|-------|--------|
| Day 15 vs 30 | 3.21  | p<0.001 | 2.233 | p<0.001 | 4.835 | p<0.001 | 1.797 | p<0.05 |
| Day 15 vs 60 | 1.811 | p<0.001 | 2.896 | p<0.001 | 1.372 | p<0.001 | 2.415 | p<0.01 |
| Day 30 vs 60 | 2.063 | p<0.001 | 7.44  | p<0.001 | 4.38  | p<0.001 | 1.797 | p<0.05 |

**Table 15: Dandruff parameters- percentage percentage distribution**

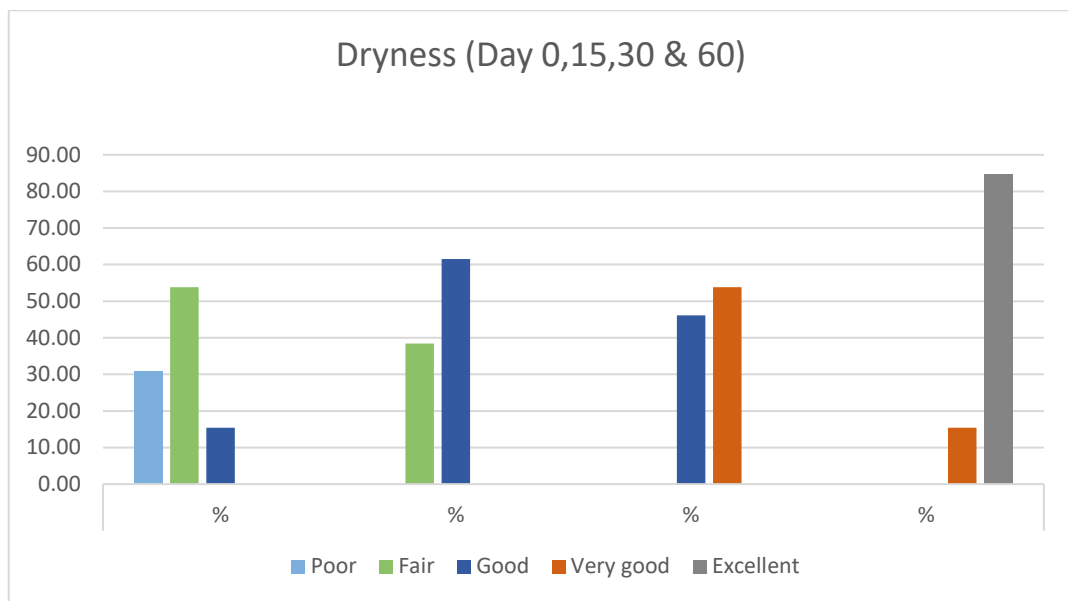
| Efficacy       | Day 0 |       | Day 15 |       | Day 30 |          | Day 60 |       |
|----------------|-------|-------|--------|-------|--------|----------|--------|-------|
|                | N     | %     | N      | %     | N      | %        | N      | %     |
| <b>Flaking</b> |       |       |        |       |        |          |        |       |
| Poor           | 5     | 38.46 | 0      | 0.00  | 0      | 0.00     | 0      | 0.00  |
| Fair           | 7     | 53.85 | 4      | 30.77 | 0      | 0.00     | 0      | 0.00  |
| Good           | 1     | 7.69  | 7      | 53.85 | 5      | 38.46    | 0      | 0.00  |
| Very good      | 0     | 0.00  | 2      | 15.38 | 7      | 53.85    | 5      | 38.46 |
| Excellent      | 0     | 0.00  | 0      | 0.00  | 1      | 7.69     | 8      | 61.54 |
| <b>Itching</b> |       |       |        |       |        |          |        |       |
| Poor           | 4     | 30.77 | 0      | 0.00  | 0      | 0.00     | 0      | 0.00  |
| Fair           | 6     | 46.15 | 4      | 30.77 | 1      | 7.69     | 0      | 0.00  |
| Good           | 3     | 23.08 | 7      | 53.85 | 5      | 38.46    | 0      | 0.00  |
| Very good      | 0     | 0.00  | 2      | 15.38 | 6      | 46.15    | 2      | 15.38 |
| Excellent      | 0     | 0.00  | 0      | 0.00  | 1      | 7.69     | 11     | 84.62 |
| <b>Dryness</b> |       |       |        |       |        |          |        |       |
| Poor           | 4     | 30.77 | 0      | 0.00  | 0      | 0.00     | 0      | 0.00  |
| Fair           | 7     | 53.85 | 5      | 38.46 | 0      | 0.00     | 0      | 0.00  |
| Good           | 2     | 15.38 | 8      | 61.54 | 6      | 46.15    | 0      | 0.00  |
| Very good      | 0     | 0.00  | 0      | 0.00  | 7      | 53.85    | 2      | 15.38 |
| Excellent      | 0     | 0.00  | 0      | 0.00  | 0      | 0.00     | 11     | 84.62 |
| <b>Lesions</b> |       |       |        |       |        |          |        |       |
| Poor           | 0     | 0.00  | 0      | 0.00  | 0      | 0        | 0      | 0.00  |
| Fair           | 2     | 15.38 | 0      | 0.00  | 0      | 0        | 0      | 0.00  |
| Good           | 5     | 38.46 | 3      | 23.08 | 1      | 7.692308 | 0      | 0.00  |
| Very good      | 2     | 15.38 | 5      | 38.46 | 4      | 30.76923 | 1      | 7.69  |
| Excellent      | 4     | 30.77 | 7      | 53.85 | 8      | 61.53846 | 12     | 92.31 |



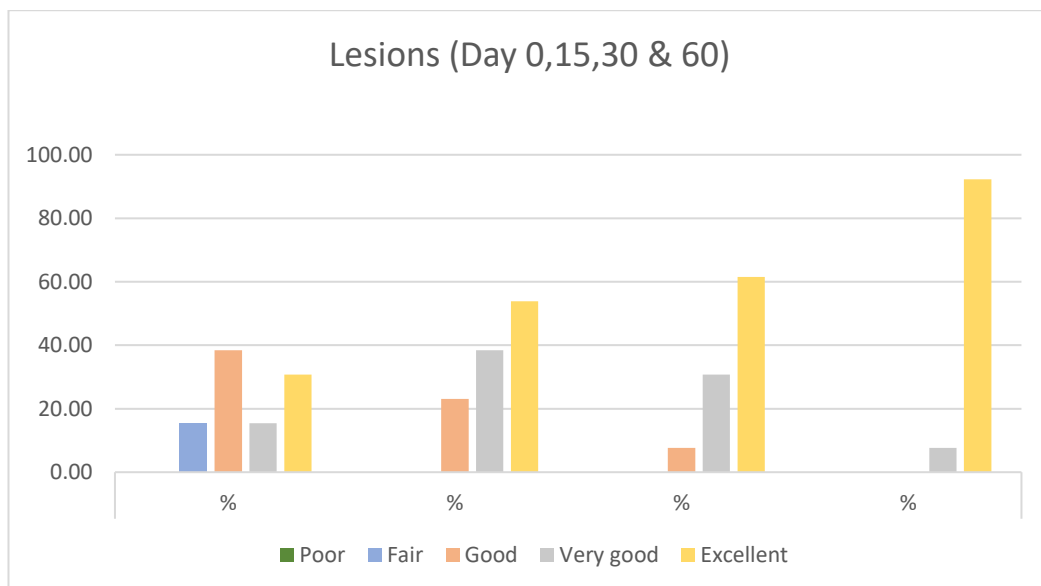
**Graph 11: Dandruff Parameter – Flaking**



**Graph 12: Dandruff Parameter – Itching**



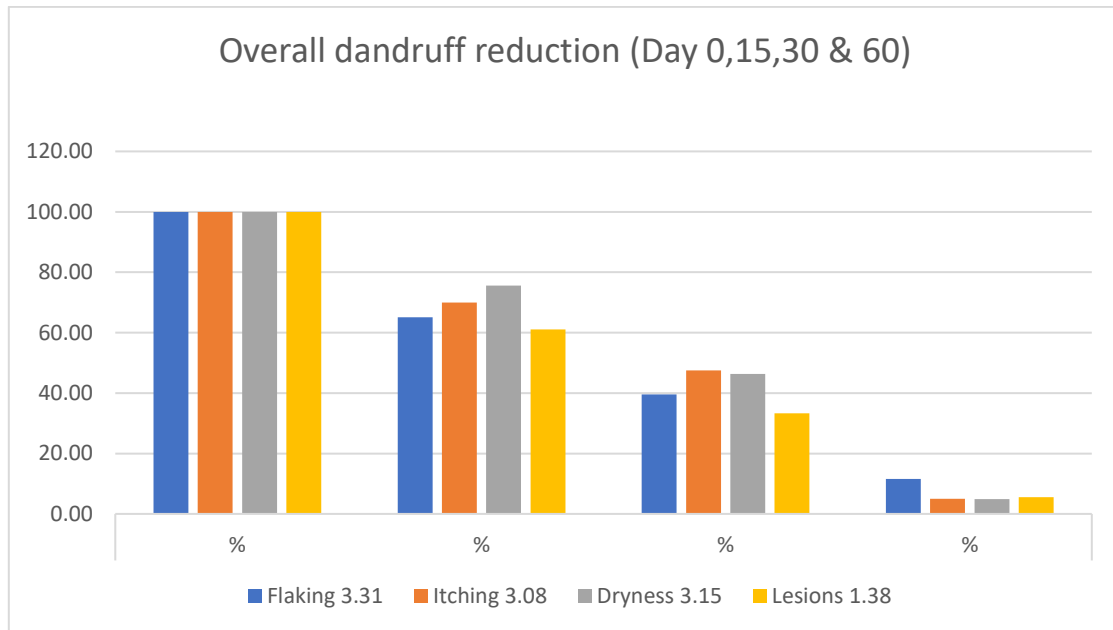
**Graph 13: Dandruff Parameter – Dryness**



**Graph 14: Dandruff Parameters – Lesions**

**Table 16: Overall performance on dandruff reduction**

|         | Day 0 |        | Day 15 |       | Day 30 |       | Day 60 |       |
|---------|-------|--------|--------|-------|--------|-------|--------|-------|
|         | N     | %      | N      | %     | N      | %     | N      | %     |
| Flaking | 3.31  | 100.00 | 2.15   | 65.12 | 1.31   | 39.53 | 0.38   | 11.63 |
| Itching | 3.08  | 100.00 | 2.15   | 70.00 | 1.46   | 47.50 | 0.15   | 5.00  |
| Dryness | 3.15  | 100.00 | 2.38   | 75.61 | 1.46   | 46.34 | 0.15   | 4.88  |
| Lesions | 1.38  | 100.00 | 0.85   | 61.11 | 0.46   | 33.33 | 0.08   | 5.56  |



**Graph 15: Overall Dandruff Reduction**